1347

THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

VOL. XCI.

JULY TO SEPTEMBER, 1905.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCI. No. 2199.] LONDON, JULY 4, 1905. [57TH YEAR. PRICE 6d.

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Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

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C. D. LENG.

High Street, Sheffield, Dec. 19, 1904.

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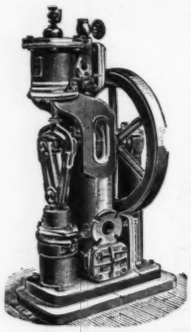

Fig. 705. "SINGLE RAM" STEAM-PUMP.

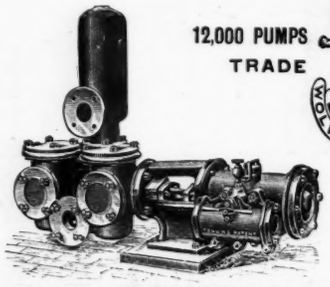

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

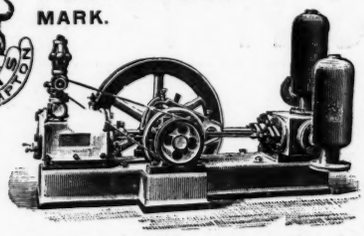

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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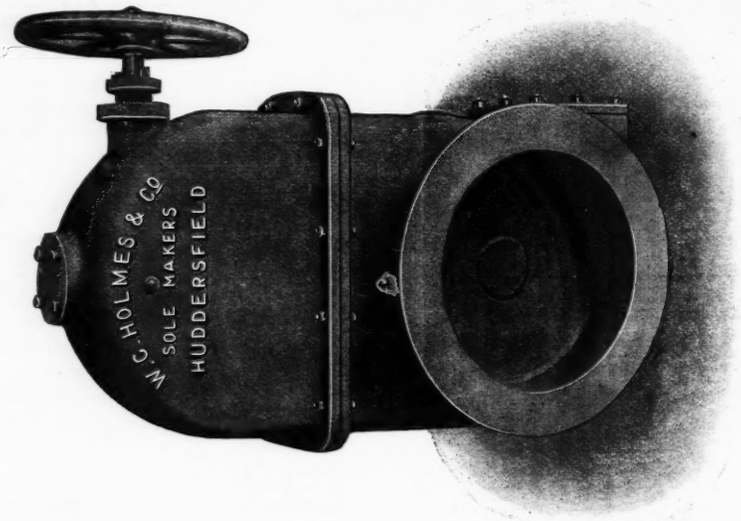

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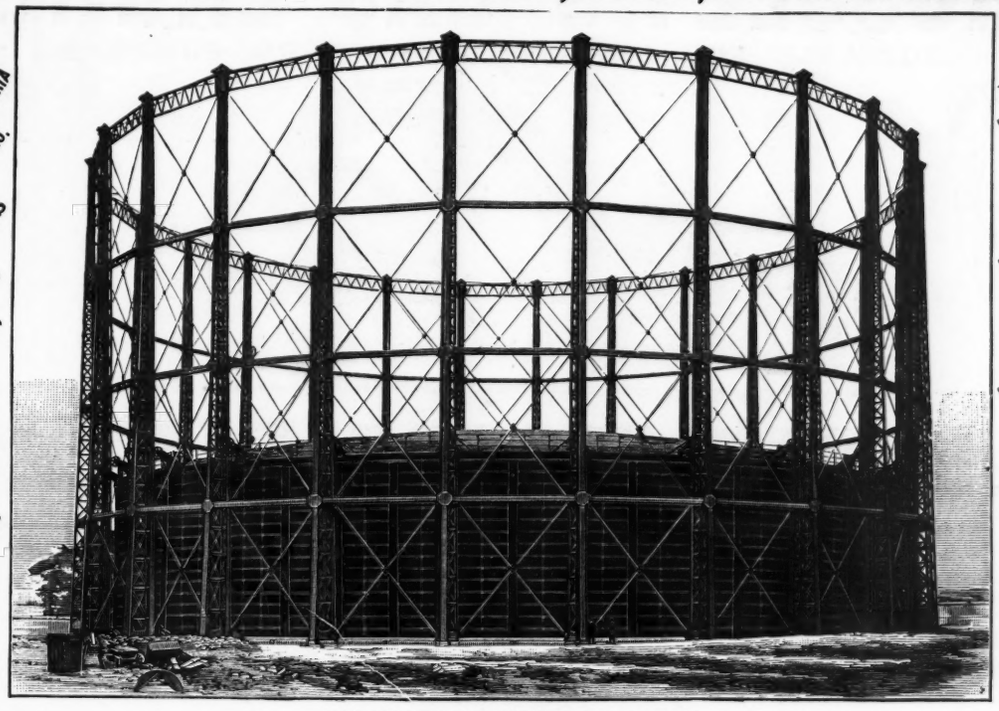

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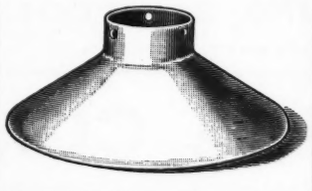

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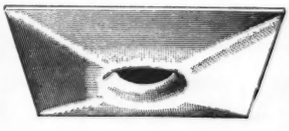

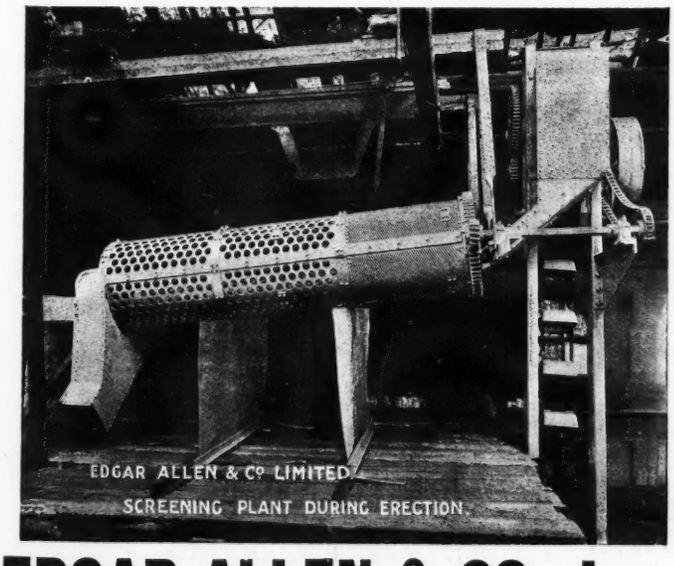

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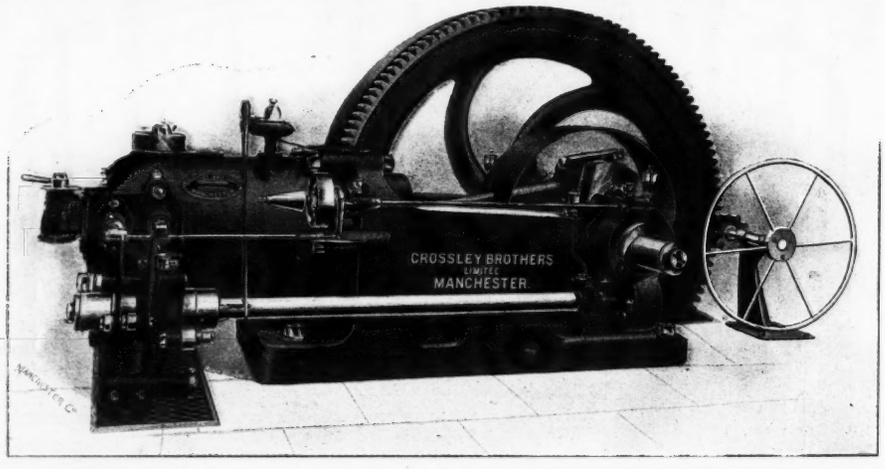

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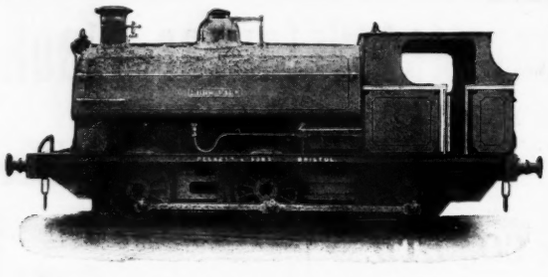

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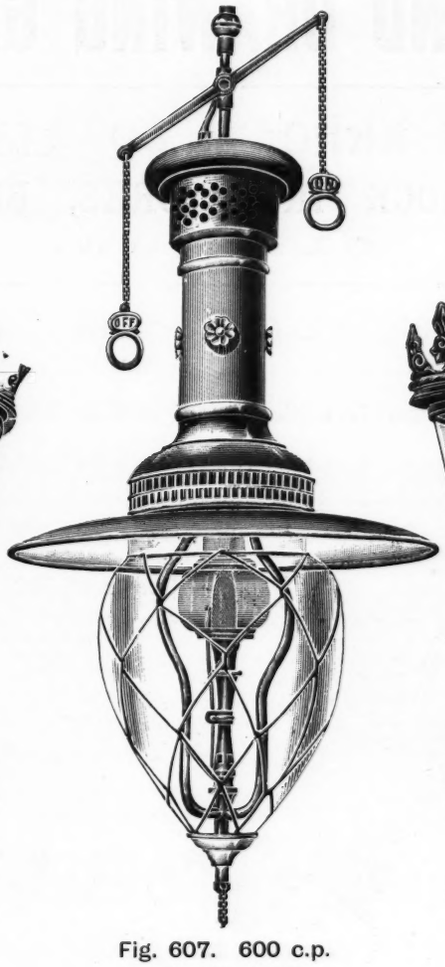

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Fig. 35a. 300 c.p.
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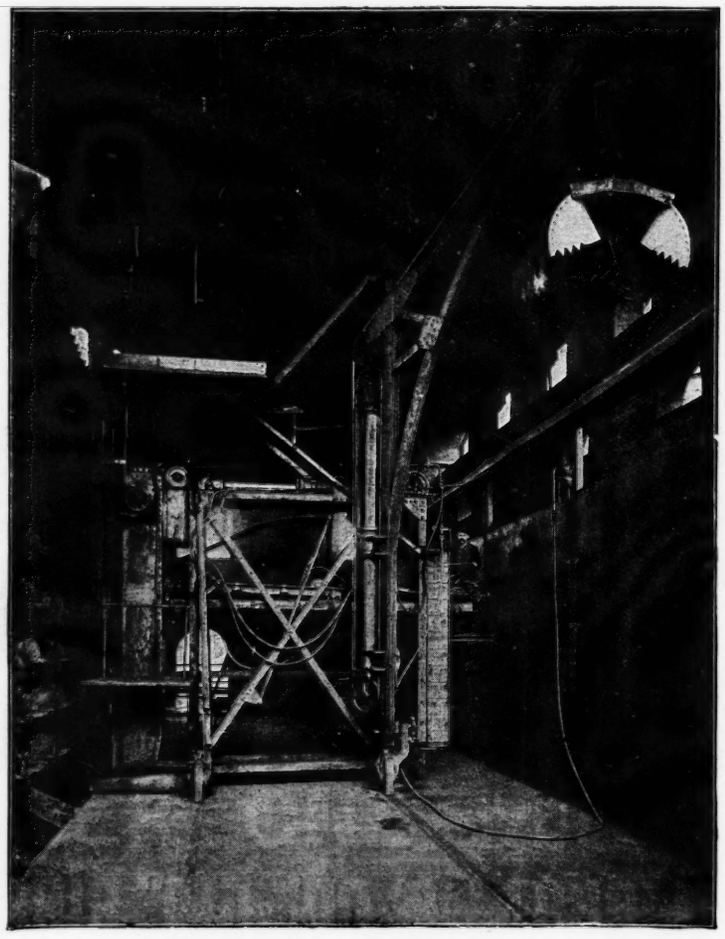

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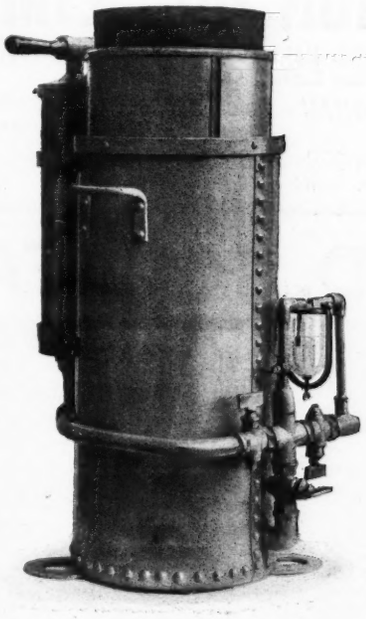

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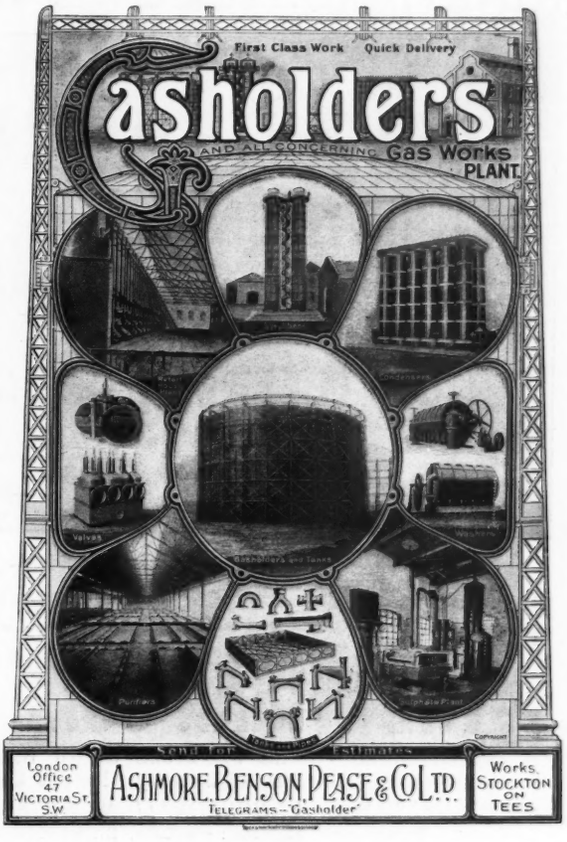

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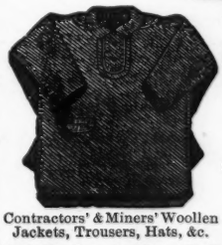

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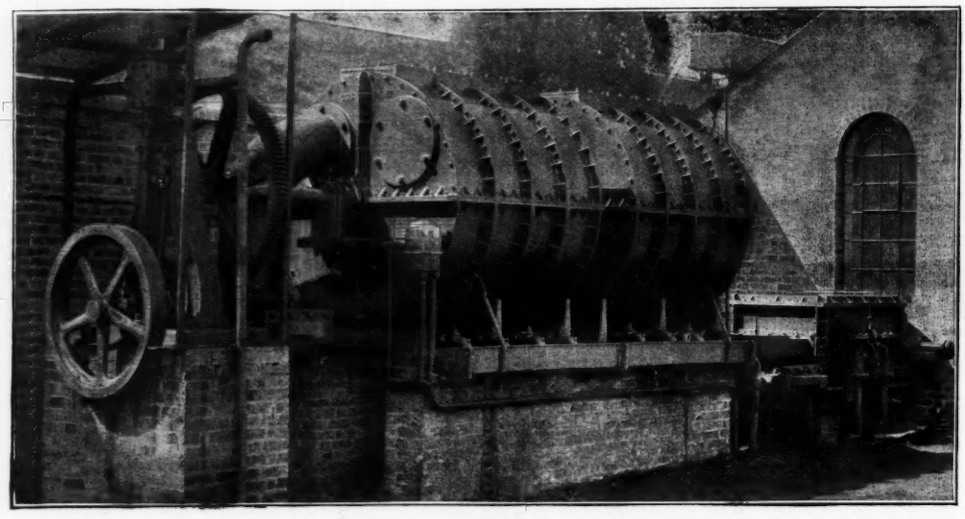

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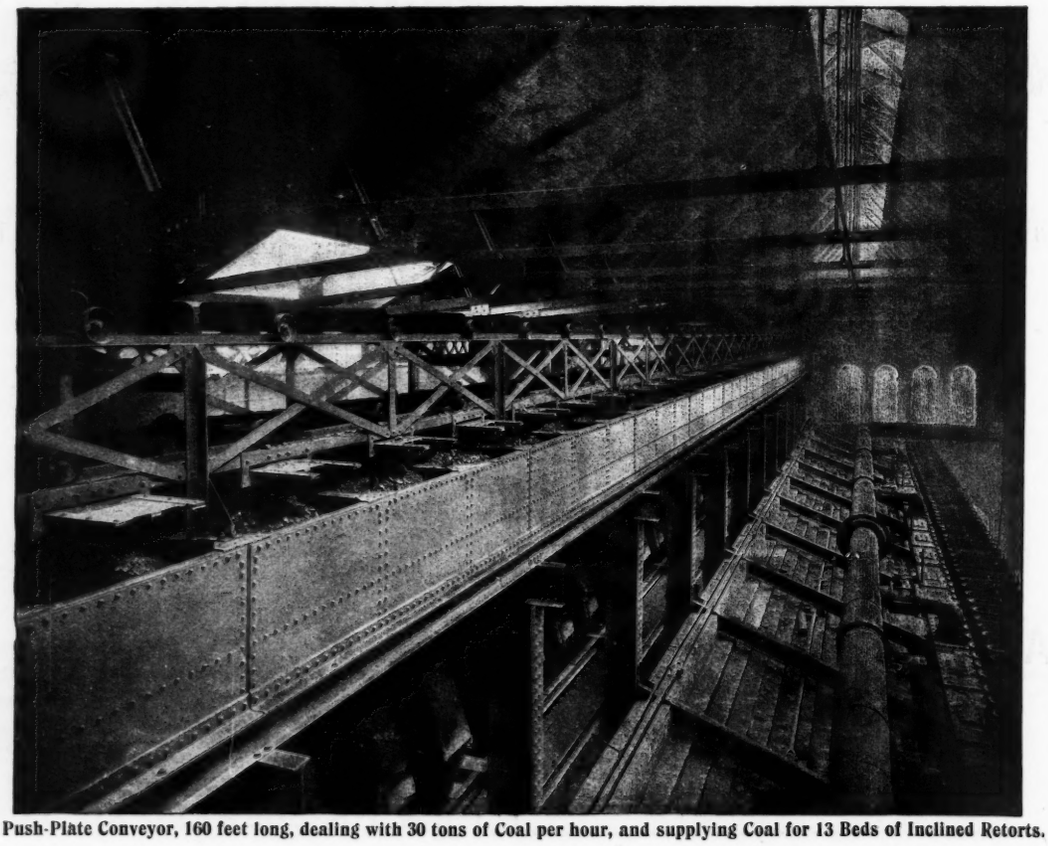

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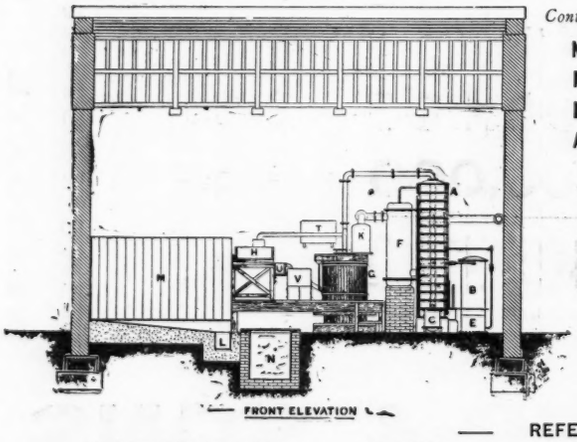

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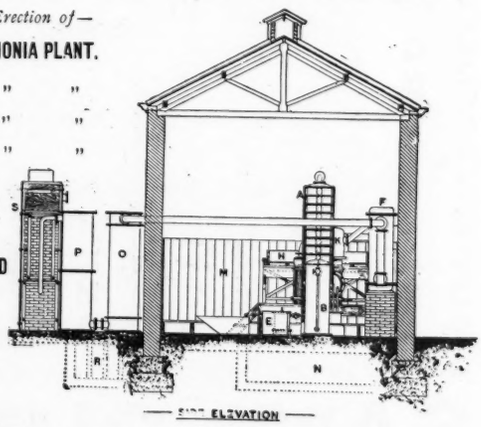

REFERENCES.

A. Large Still (Ammonia).	*G.* Saturator.	*M.* Sulphate Store.	*R.* Settling Tank.
B. Small Still (Lime).	*H.* Draining Table.	*N.* Acid Store Tank.	*S.* Neutralization Plant.
C. Spent Liquor Valve.	*K.* Lead Catch Box.	*O.* Condenser.	*T.* Acid Supply Tank.
E. Limeing Arrangement.	*L.* Mother Liquor Well.	*P.* Scrubber.	*U.* Mother Liquor Trough.
F. Heater.			*V.* Mother Liquor Receiver.

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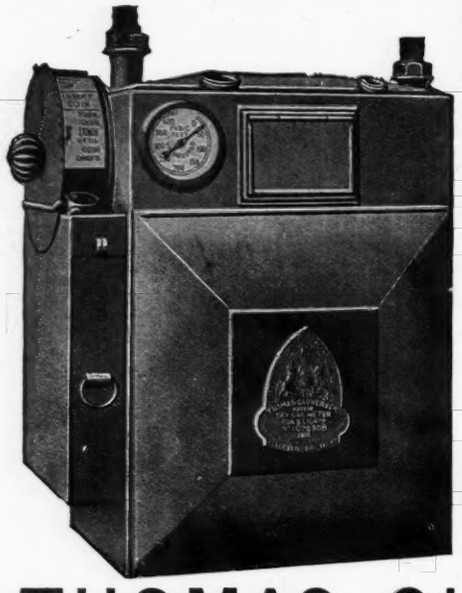

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EDITORIAL NOTES—GAS, &c.

The Inland Revenue and Conveyance Duty.

WE are afraid that the conclusion must be drawn from the accumulation of legal opinion that the claim of the Inland Revenue Commissioners to the payment of *ad valorem* stamp duty on the conversion of a non-statutory company to a parliamentary one, and the vesting of the property of the former in the latter, is perfectly valid. The question was brought under consideration in these columns on May 2 and 23 last; and we were able to cite in the articles which then appeared the separate opinions of three legal luminaries, and two of the three were favourable to the Inland Revenue. It has been considered by certain of the companies affected that their change of estate was merely a reconstitution; and that there was no vesting "by way of sale" according to the meaning of section 12 of the Finance Act of 1895. Doubt existed; and it was thought by some of the companies concerned that this was a matter that the Gas Companies' Protection Association might well take up, though, as we have before pointed out, few non-statutory gas companies have interested themselves in supporting the Association. However, they may now regard the improvement of their relations with that body from a different point of view. It was recently learned from the Secretary of the Association (Mr. F. E. Cooper) that the Committee had taken steps to obtain the opinion of Mr. Danckwerts, K.C., upon the point at issue; and his opinion has since been received. An application from us has secured from the Chairman of the Association (Mr. H. E. Jones) an authorization for its publication; and it will be found in the present issue. Mr. Danckwerts is clearly of opinion that, if a case were contested, the Inland Revenue would succeed in getting their views confirmed by the Courts; and his reasons for this opinion are stated. This is a corroboration of two out of the three legal opinions already published; and with them, too, Mr. Danckwerts is in agreement as to the way the amount of the consideration on which duty is payable is to be ascertained. This does not leave room for much hope of any successful resistance to the claim. The Gas Companies' Protection Association are to be thanked for taking this step; and nothing more can be expected of them, as they will, of course, be guided by the advice they have received. Whether non-statutory companies will be content to accept it as final cannot, of course, be said. It is still open to those interested to take concerted action to ascertain whether Somerset House will consent to the submitting of a special case to the Courts, or to contest a case in the ordinary way. But, in the face of the three opinions before us, and knowing the origin of those to which names have not been publicly appended, we cannot avoid the feeling that the money spent would only produce such satisfaction as is to be obtained from the confirmation of the repeated views of high legal authority.

The London Gas Bill—The Last Phase.

BY the time this issue of the "JOURNAL" is in the hands of our readers, the fate of the London Gas Bill will have been decided—the adjourned hearing of it having been fixed for to-day; and it being generally understood that terms of a compromise are practically settled. That in its final shape the Bill, in the event of its survival, would be favourable to the Metropolitan Gas Companies, was looked upon as inevitable after the decision of Lord Rosse's Committee on the clauses relating to testing for illuminating power; the only remaining doubt being as to whether the London County Council would think it worth their while to go on with a Bill which, initiated by them for the purpose of "regulating" the Gas Companies, has been converted into one for securing them a greater amount of freedom than they have enjoyed for the best part of half-a-century. It was known that, although the withdrawal of the Bill was talked about, the Council—especially after the evidence given by Mr. Vernon Harcourt—had but little stomach for further fighting, and were chiefly anxious to secure a "virtual" victory. To this end, they have since appeared to be ready to surrender to their opponents more than the spoils of victory, inasmuch as, in exchange for a recognition of the 5 cubic feet rate of consumption, they have been willing to concede the most suitable burner for 14-candle gas. They appear to derive as much satisfaction and comfort from the words "5 feet rate "of consumption" as did the traditional old lady from "the "blessed word Mesopotamia." That, however, which was in her a perfectly harmless sentiment, is, in the case of the London County Council, wholly pernicious and detrimental to the interests which they are supposed to guard.

The Council's inability, on purely sentimental grounds, to accept the plain ruling of Lord Rosse's Committee can only be described as idiotic, since it is certain to result in further advantage to the Companies. At the same time, it is unfortunate in the extreme, because it will have destroyed the fairest chance that has ever presented itself during recent years of establishing a uniform system of gas testing. They need not indulge the expectation that, in conceding the selection of the most suitable burner for 14-candle gas which is at the same time practicable for use by the consumers, they are settling this question once and for all. They will be doing no such thing. The question will have to be fought over again, and probably in the next session of Parliament; and this prolongation of the fight will have been entirely owing to the weakness of the London County Council and their advisers. The Institution of Gas Engineers did not move in this matter simply with the object of supporting the Metropolitan Gas Companies. It was because they saw in the recommendation of the Departmental Committee of the Board of Trade a menace to the interests of the gas industry generally, and to the universally expressed desire for a uniform system of gas testing. They are not likely to feel themselves bound by any compromise it may be deemed by the London Companies expedient to agree to, but will doubtless take such further action as, after full consideration of the terms of settlement, may seem to them desirable. Having put their hands to the plough, it is hoped and believed they will not look back until the end of the furrow has been reached.

Competition Within and Without.

MUNICIPAL authorities who own both gas and electricity undertakings have not been content to let well alone. The gas business has been for them, in so many cases that the exceptions only prove the rule, a most lucrative one; but the burning desire to be the possessors also of an electric light undertaking has had for many most dire results. Not only is it a fact that—working as municipal authorities have to do on borrowed money, which has to be repaid within a certain period, and annually demands a definite interest, whether it has been earned or not—this system of carrying on a speculative business has in several towns been disastrous from a financial standpoint; however, in the anxiety of the councillors to put a better complexion on things, they have taken every conceivable step to do injury to their more profitable gas undertaking, which gives them no anxiety whatever. They withdraw from the gas department a large part of the street lighting, and hand it over to the electricity department, though the gas undertaking is in a position to do the work infinitely better, and with certainty, at considerably less cost to the ratepayers. By free wiring, and all the other seductive devices that have been invented by hard-pressed electricians, they work zealously too to win from the gas department private custom, and so damage the business of the municipal concern that is more productive, and that can, the more extended the business, render the greater service to the community. Against this unfair fostering of one department to the detriment of the other, the gas committees and officials constantly and strenuously contend; but they contend with an inequality in numbers, as, strange as it may seem, the majority of municipal councillors are prepared to immolate the more productive public concern to

the less fortunate favourite. These are the Messrs. Facing-Both-Ways of our civil life; for these very men are those who, if they were the private owners of these competitive businesses, would certainly work for all it was worth the one that brought them the greater return. But with all their favouritism in the municipal chamber, and with all the wiles of the electrical department, though the progress of the gas business is retarded, it still makes progress.

It is more than possible, it is certain, that in the near future some of these municipal authorities will have to review their position; for the competition that the electricity power companies will be offering them for power supply, and for lighting where electrical energy is used for power, must make the more intelligent municipal councillors pause, and consider whether it will not be to their advantage to encourage the stronger of their two lighting and power departments to show fight against the inroads of the power companies. The advent of these power companies (where they are not expressly shut out from competition) creates a peculiar situation for a considerable number of municipal purveyors of both gas and electricity. With their electricity department, they are doing their best to throttle, or to divert business from, the gas undertaking; and now their own electricity undertaking (in most instances lacking the necessary financial stability to resist the shock of such an assault) is open to immediate attack from a power company. In happier case will be those local authorities whose status is not of the most distinguished who are taking current in bulk from a power company at a low price, and are distributing it from their own sub-stations to consumers. Of course, there are all the capital and ordinary distribution expenses to be met; but there is no competition, and no idle capital in large buildings and generating plant. There are, however, only eleven local authorities and four companies who do this at the present time; but the Local Government Board, it is known, are favouring this system for small towns rather than consent to a heavy capital expenditure for individual generating stations which experience has distinctly and abundantly proved cannot be made to pay in a certain class of district, especially where gas is distributed at a reasonable rate. Local circumstances and demand, of course, alter the argument for and against municipal authorities purchasing in bulk. But the gas supplier, be he municipal or company man, would decidedly prefer to compete with electricity obtained in bulk in this way (provided the municipality had not already committed themselves to heavy capital expenditure on plant of their own), as it is the heaviness of the capital commitment for electricity supply that induces town councillors to work on the principle that it is not at all a bad thing to rob Peter to pay Paul, so long as by the act they can get out of the muddle to which they have been consenting parties, and present a respectable face to the ratepayers. With smaller capital obligations, there would not be the same incentive to give up a cheap and efficient system of public lighting for a system involving a large capital expenditure and a much heavier annual charge than formerly; and the private gas suppliers would not, in such a large number of cases, be compelled to contribute through the rates to the support of the competitor.

To return to the competition of power companies. The South Wales Electrical Power Distribution Company have commenced their competitive campaign, and are making what appears likely to be a ruinous attack on the electrical undertaking of the Pontypridd District Council, who are also the owners of the gas undertaking. Announcements in the Glamorganshire papers inform the residents that the Power Company are prepared "to supply at once everybody "in Pontypridd with electrical energy for power and lighting "for 1½d. per unit." Now, anyone who uses the Company's energy for power, however small, for any purpose—even for such domestic purposes as knife or boot cleaning, for coffee or sewing machines—can have an unlimited amount of current for electric lighting at the inclusive charge of 1½d. per unit. What is the position of the District Council? They erected a generating-station on extravagant lines, for traction and lighting; and this they have done in preference to accepting the offer of current from the Power Company at 1½d. per unit. The "Glamorgan Free Press" informs us that the charge of the District Council is 2d. per unit, except between 6 and 8 p.m., when the price is 6d. per unit. It is not to be marvelled at that the inclusive all-round charge of 1½d. per unit of the Power Company has "suddenly startled" the Council "out of its restful satisfaction over its municipal "trading;" and we can quite agree that "among ordinary "mortals not interested in forcing municipal trading upon "a patient and rate-burdened community, the principle of "buying in the cheapest market is so well understood that "there is really nothing very strange in the likelihood of "the consumers adopting the 1½d. light, instead of the 6d." Competition might have been averted by accepting the offer of 1½d. per unit; and the ratepayers cannot possibly to-day look with composure upon the Council's speculation, which must mean a perpetual burden upon them, unless the circumstances change considerably.

Meantime, what has this Council been doing for their gas undertaking, which has flourished so conspicuously under excellent management that the accounts show the consumption has grown from 70 million cubic feet in 1900 to 116 millions in 1905? They have been using the subtle charms of "free-wiring" to take from their gas business customers for the Electricity Department, which, in turn, has now to compete with electricity at 1½d. per unit. We should not be surprised to hear that anything between 100 and 200 gas consumers have, by the "free-wiring" method, been cajoled into signing agreements, which now they must repent having done, and will repent even more when the true facts of their position are presented to them in their dual capacity of ratepayers and customers for artificial lighting. Although the Gas Department are sure to see further gas consumers fall from the shafts that will come from the two electrical quarters, they will continue to come out on top, and need not fear the ultimate consequences of the competition. We get all sorts of estimates from electricians as to the comparative cost of electricity and gas. The number of units equalling 1000 cubic feet of gas have been variously computed as being from 5 to 10. The South Wales Electrical Power Company in their advertisement say that, for lighting purposes, electricity at 1½d. per unit is equivalent to gas at 1s. 6d. per 1000 cubic feet. So that now we have got up to 12 units as being the equivalent of 1000 cubic feet of gas. Let us make a reckoning on electricians' own figures, taking this calculation of 12 units, and the price of 1½d. per unit, as the basis. Quite recently, at Smethwick, an electrician, touting for business at a public meeting, stated that thirty 8-candle power electric incandescent lamps could be maintained for one hour with one unit of electricity. Therefore in Pontypridd, $30 \times 8 = 240$ candles, which can be obtained by the payment of 1½d. per unit; 240 candles $\times$ 12 units = 2880 candles, which will cost 1s. 6d. As on a previous occasion we pointed out, a consumption of 100 cubic feet of coal gas is sufficient for 30 ordinary incandescent gas-burners, giving approximately 50-candle power (we are not speaking of the cheaper high-power burners, which are not needed for ordinary illumination). Now, 30 burners $\times$ 50 candles = 1500 candles for 100 cubic feet of gas. Double the number of burners, and we get 3000 candles for 200 cubic feet, which exceeds the candle power obtained from the 12 units of electricity at 1½d. per unit. Therefore, light for light, gas must be sold at 1s. 6d. per 200 cubic feet, or 7s. 6d. per 1000 cubic feet, to realize an equality in the matter of cost with electricity sold at the low price of 1½d. per unit. This is the result of taking the electricians' own figures as to the number of lamps a unit will sustain for an hour, and the number of units equalling 1000 cubic feet of gas. The Pontypridd Gas Department have only to show this prominently to the inhabitants to make the triangular contest for custom a most interesting one. Is it not now plain to the District Council which department they should enthusiastically push to meet the serious electrical competitor standing so ominously not at their doors, but in their very midst? [Since this article was written, it has been announced that the District Council are going to take Counsel's opinion as to the legal right of the Power Company to supply energy for domestic purposes.]

A New Junior Gas Association.

The suggested addition to the already highly satisfactory list of Junior Gas Associations has now become an accomplished fact; and the most cordial congratulations are due to those who have laboured to this end. When returning thanks for his appointment to the position of President of the Midland Association of Gas Managers, at the meeting held at Earl's Court last December, Mr. Thomas Berridge, of Leamington, expressed a strong wish that a Junior Association covering the same district should be

formed; and, together with the Hon. Secretary (Mr. Charles Meiklejohn, of Rugby), and the Committee, he has since actively interested himself in the matter. The outcome will be found duly chronicled in another column. A well-attended meeting held in Birmingham on Saturday agreed to the formation of a Junior Gas Association for the Midland Counties; and a Provisional Committee were appointed to draft up a set of rules to be submitted at another meeting to be held next week. More than this was done, however, for the meeting decided straightaway two important points which will affect the welfare of the Association. The first of these had reference to the provision of a "connecting link" between the Senior and Junior Midland Associations, by constituting the President and Secretary of the latter *ex-officio* members of the Committee of the former—a proceeding which will be duly reciprocated by the Seniors at the first opportunity. The second related to the qualification for membership; and this it was determined should be upon the widest possible basis—short of including those engaged in the manufacture of gas appliances. Beyond all question, the conclusions arrived at on both matters augur well for the future prosperity of the Association. Nothing but good can possibly arise from close contact of the Senior and Junior organizations; while it would be both unwise and unkind to deny to anyone wishful to improve his position in the gas profession the help which membership of such a society would render him in doing so. Mr. Berridge hit the nail exactly on the head, when remarking that "it should not go forth that they only wanted those to join who could do good to the Association; they wanted all to whom the Association could do good." This one sentence surely sums up what should be among the chief aims of these Junior Associations—namely, to educate and improve. Members will not join for the purpose of attending the meetings and discussing subjects of which they are past-masters, but rather with the idea that they may learn things they do not already know, and by practice qualify themselves to take part in the proceedings of the Senior Associations when, happily, their positions in the industry will render them eligible to do so. Let this be always clearly kept in mind, and the organization will indeed have a useful existence. Much as the Midland Association have done with regard to the formation of the Junior Association, this does not by any means exhaust their efforts on behalf of the younger men, for negotiations are also being carried on having for their object the inclusion of classes on "Gas Manufacture" among the subjects at the Birmingham Technical School. This, however, is "another story," for these classes will be altogether distinct from the Junior Association, with which we are for the moment concerning ourselves. It only remains to be remarked that in both directions the praiseworthy efforts of the Association promise to be eminently successful. Already Mr. Meiklejohn has received no less than 52 promises to join the Junior Association; and this number is certain to be considerably augmented when everything gets into working order. The promises to join the classes on "Gas Manufacture" are still more numerous, they having reached the gratifying total of 56.

The Devonport Slander Case.

While everyone concerned in it is to be congratulated upon the settlement of the Devonport slander case, we cannot but regret that the occasion for such an action should ever have arisen. Mr. Hornbrook has, through his Counsel, withdrawn all imputations against Mr. S. E. Stevenson, expressed regret for having made them, and agreed to pay £250 as damages and Mr. Stevenson's costs. At the same time, Mr. Hornbrook wishes it to be understood that he was led in the excitement of the discussion at a heated and turbulent meeting to use words which he had not intended to employ, and to convey an impression which he did not mean to convey and had no intention of attempting to substantiate. We have no wish to revive a controversy which is now dead and buried. It must, however, be confessed that these admissions and apologies come somewhat tamely after the boastful challenges in which the Chairman of the Devonport Gas Committee indulged when formulating his charges against the then Gas Engineer. They mean, if they mean anything, that there was no excuse or justification for the off-handed and arbitrary manner in which Mr. Stevenson was treated. The Chairman of the Devonport Gas Committee may hold strong opinions with regard to the merits of a particular system of gas manufacture; but however firm his conviction on this subject, he certainly ought not to have allowed his feelings to have carried him to the length of impugning the character of the Gas Committee's technical adviser. Probably, if the case had been tried out it would have been found that Mr. Stevenson was largely the victim of party feeling. There is no reason that we have been able to understand why the cause of carburetted water gas should be espoused by one party in the Devonport Town Council and that of "straight" water gas by the other, except that, being partizans, the one side feels it necessary to oppose what the other takes up. Mr. Stevenson is by no means the first man who has found himself between the hammer and the anvil in a dispute of this kind. If he had happened to be on the side of the majority in the Council, he might have been exposed to the abuse of the minority, but would have had such support as would have enabled him to retain his position. As it was, he was driven into the resignation of his post, and compelled to take legal proceedings for the vindication of his character. We congratulate him upon the complete success which he has gained in the action. That he should have been compelled to bring it is not to the credit of the system of managing commercial undertakings on municipal party lines.

Results at Nottingham.

There are some interesting points in the report to his Committee by Mr. J. H. Brown, the Gas Engineer at Nottingham, on the working during the twelve months to March 31. The year has not by any means been altogether a period of plain sailing. Here, as at other places, we see the effect of bad trade and the largely extended use of incandescent burners; while there has (as was anticipated by Mr. Brown in his last report would be the case) been a very heavy falling off in the value of chemical products. The decrease in the consumption of gas amounted to no less than 5·14 per cent.; and the returns from tar products and ammoniacal products shrank in value to the extent of £10,640. But there is a very bright side to the accounts. Notwithstanding a slight rise in the percentage of unaccounted-for gas, due to colliery workings, the number of cubic feet of gas sold per ton of coal carbonized reached the highest figure ever recorded by the undertaking; the make per ton having increased by 500 cubic feet, which was equivalent to a gain of 95 million cubic feet of gas from an equal quantity of coal. Another record is shown in the carbonizing wages per 1000 cubic feet of gas sold, which have been reduced from 2·95d. to 2·92d. Mr. Brown must have had an anxious time last December, on one day of which month the consumption left the previous top figure behind by about half-a-million cubic feet; but he will, with the completion of the extensions at the Basford works, be in a more comfortable position in times of fog. In view of the adverse circumstance mentioned, there is, of course, a heavy falling off in the receipts for gas; but £7000 (or just over one-third) of this is due to a reduction in price which was in operation during nine months of the year under review. But in spite of the fact that £20,013 less was received for gas, and that there was a fall in residuals of practically £15,500, the surplus profit is, with the exception of last year, the largest ever realized—a very satisfactory state of affairs for times of depression such as have lately been experienced. When trade gets back to its normal condition, and residuals realize better prices, Mr. Brown should have no difficulty in passing all the previous "bests" of the Nottingham gas undertaking.

A Candid Circular on Electric Lighting.

One of the plainest and most straightforward statements as to the comparative cost of gas and electricity has just been presented to the inhabitants of Ripon by the Town Clerk (Mr. M. Kirkley). The Corporation are in possession of an Electric Lighting Order, and they are exercised as to whether they shall themselves provide plant and supply current, or make arrangements with a private company to do it. With the view of ascertaining to what extent they would be supported by the residents, they have submitted to them, through the official named, a few facts for their consideration. The Corporation are allowed to charge a maximum of 8d. per unit, with a condition that not less than 13s. 4d. per quarter is charged to any one consumer for a supply up to 20 units. So much for preliminaries. Now comes the candour of the circular. Professor Fleming is quoted to show that a Board of Trade unit will keep an average 16-candle lamp going for 18 hours; and

Professor Lewes to show that 1000 cubic feet of gas will keep a 60-candle incandescent gas-burner alight for 286 hours. Consequently, one gas-burner is as good as four electric lamps, and 1000 cubic feet of gas are equal in light-giving power to 60 Board of Trade units of electricity. Mr. Kirkley follows up these interesting facts by some particulars of a financial character which will no doubt have the close attention of the inhabitants. Taking a room 14 feet square, he proves to demonstration that while four electric lamps would be needed to properly light it, this could be done with two 60-candle incandescent gas-burners for 1000 hours; in other words, the consumption of gas would be 7000 cubic feet against 222 units of electricity, at a cost of £7 9s. 4d. for the latter against £1 3s. 4d. for the former illuminant. Even supposing the Corporation could afford to supply current at 4d. per unit, or half the maximum allowed, electricity would still come to £3 14s. 8d., or £2 11s. 4d. more than gas. On the score of economy, therefore, it certainly does not commend itself. As to the initial outlay, the lowest estimate of the cost of carrying out the Order is £15,000, the interest and sinking fund on which would come to £765 per annum. Working expenses, of course, cannot be calculated. In face of these statements, which are submitted for the "information and guidance" of Ripon inhabitants—Mr. Kirkley judiciously refraining from expatiating on the advantages or disadvantages of electricity or gas—we doubt whether there will be a very general response in the affirmative to the inquiry contained in the circular as to whether the recipient favours the supply of electricity by the Corporation, and will undertake to be a consumer; and we await with much interest the announcement of the result.

The Report of the London Traffic Commission.

In view of the close connection between gas and water companies and the authority that has control of the public streets, special interest attaches to the result of the inquiry into the subject of London Street Traffic which has been for some time in progress by the Royal Commission presided over by Sir David Barbour. The Commission was so constituted as to represent almost every kind of Metropolitan interest; and in the course of their long investigation all phases of local street government were considered. The outcome of their labours will soon be definitely known, as the report is expected to be in the hands of the public in the course of a few days. Meanwhile, something like a forecast of the scope of the report has appeared. Considering the diversity of view of the members of the Commission, a unanimous conclusion was hardly to have been expected; and therefore a minority report will not come altogether as a surprise. In one case, even where the majority report is accepted, a far more advanced scheme than that recommended is suggested in a memorandum. Of course, specific information as to the exact nature of the proposals that are made by the Commissioners must be awaited until the publication of the report; but it is generally understood that one of them is the establishment of a Traffic Board, to whom all applications relating to new lines, methods of transit, and traffic generally, will have to be made, whether by private persons or by municipal authorities. Thus a new body will be constituted, the effect of whose operations will be to place on a uniform basis the regulation of the network of routes in the Metropolis. Another recommendation will, it is understood, relate to a comprehensive scheme of street widening, which must prove a costly business to the ratepayers. However, as the recommendations of the Commission, whatever may be their exact nature, will have to be sanctioned by Parliament, plenty of time will be afforded for discussing their merits. Any proposals which will be inimical to the existing interests of the bodies responsible for the supply of gas and water in the Metropolis will have to be carefully watched, as otherwise the improvement of one branch of the public service may be effected to the detriment of another.

The West Suburban Gaslight and Coke Company, Limited, has been registered with a capital of £30,000, in £5 shares (3000 of them 6 per cent. preference), to adopt an agreement with Messrs. W. Darby and Co. for the acquisition of the Colnbrook Gas-Works; to manufacture, sell, and supply light in Colnbrook and its vicinity and elsewhere; and to carry on the business of a gas company in all its branches.

WATER AFFAIRS.

British Association of Water-Works Engineers.

Numbers, both large and comparatively small, in the membership of technical organizations have their respective advantages and disadvantages. The larger an Association grows, of course, the more affluent it becomes, both financially and technically, and the greater its working possibilities. But when the membership of an organization does not exceed (say) 300 or 400, it is a manageable body, and its mobile capacity is greater than one boasting bigger figures. The larger organizations, as the Institution of Gas Engineers find, are limited in their range of suitable places for meetings; the smaller ones have the advantage of greater choice. Hence it is that during the ten years' existence of the British Water-Works Association, they have each year, with great advantage to themselves, been able to change the (to appropriate a legal term) venue of their annual summer meetings. The successor of Mr. F. J. Bancroft in the Presidential Chair is Mr. P. H. Palmer, M.Inst.C.E., the Borough and Water Engineer of Hastings; and it was in this much-favoured southern seaside resort that the members held their annual meeting last week, when all the ancient traditions of the town in respect of hospitality were sustained by the benevolent Mayor (Mr. Charles Eaton) and the Corporation, whose honoured official the President is. Mr. Palmer is an ardent believer in such organizations moving from place to place in order that the members may see for themselves what other people are doing; and he laid this down as a principle that should be, as far as possible, religiously observed in the conduct of such societies. Moreover, he declares that what is good for officials, whether Corporation or Company, is equally good for their Committees and Boards; and in his presidential capacity, at the luncheon given by the Mayor, he told his Worship and the members of the Corporation as much. Staying at home has the effect of encouraging too much self-esteem, and the harbouring of the egotistical idea that what is best is only to be found at home. All that is best is not to be found in Hastings or in any other town; and, this being so, it is the height of wisdom for both administrators and their officials to travel, so as to take account of what others are doing. This must result in benefit to those they serve, and will certainly prevent any rank growth of conceit in themselves, unless conceit has already obtained such hold that it blinds to the good in others and to their work. This is one of the lessons that the President tried to inculcate at last week's meeting; and if members of Corporations and Boards of Directors would look at the matter with the same broad view, there would be less cavilling over reasonable expenditure by administrators and officials in seeking knowledge than we get in these days of the singular type of administrator who calls himself "Progressive," but whose acts show the perversion of the title.

The address with which the President inaugurated his year of office was of that compact and thoughtful order of composition which makes one wish there had been more of it. It does not matter which branch of engineering one turns to, it is found that daily the conveniences of the people of the world demand more and more of the individual engineer, and impose on him, no matter what his sphere of activity, greater responsibilities. And if comparison can be made at all with the view to determining the relative measure of responsibility, then the engineer takes first place who provides and brings to the hand of the growing millions the first necessity of life that needs provision. With the growth of population, the extension of districts, and claims upon the most accessible sources of water, the responsibility itself grows, and the practice of water engineering becomes, as the President puts it, "more technical and complicated." That one statement of the President gives an opening for much reflection, which expands in importance the longer the meditation. The prospect is one which shows how much greater will be the demands of the future, how much more difficult compliance with those demands, and therefore how much greater the claims upon the skill and prevision of the water engineer, whose ability and attainments will of necessity have to be equal to the extended requirements. The Association was brought into existence at a time when the great "scramble" for watersheds was at its height. It has well established itself before more serious aspects of the problem of daily water supply present themselves. This

being so, the stronger the organization can be made, the greater will be its influence in the unknown future, of which judgment can only be formed by the application to it of the knowledge of to-day. We seem to detect among, we hope and believe, only a small section of the present members a tendency to exclusiveness in connection with the Association. To nurture that tendency would be to impair the influence and vitality of the organization in the future; and, be it remembered, all that pertains to that future in respect of water supply and engineering will be more "technical and "complicated." The organization exists not only for the present; and it can exert, by the continued strengthening of the combination of talent in the present, a great educational power for application hereafter.

The President made some grave statements concerning typhoid epidemics; and it amounted to a charge of maladministration on the part of certain water authorities when he deliberately said: "I think there are few cases where "epidemics have taken place due to polluted drinking water "in recent years which could not have been largely prevented "by daily or bi-daily analysis of the water, and filters of such "adequate area that a change-over could be frequently "made." The gravity of this cannot be minimized; and it is a matter for regret that the accusation of neglect implied by the statement cannot have greater circulation than it will gain. The application of present-day scientific knowledge—bacteriological and chemical, combined with engineering—will not only prevent calamity, but it can be the means of bringing into use large quantities of water which are contaminated to but slight extent, and can be rendered perfectly innocuous. The President's observations on these points are weighty and yet pithily expressed; and they should command the profound consideration of those who rest under a mistaken satisfaction with mere rule-of-thumb procedure in relation to the provision at the tap of a constant water supply. The President diverted attention to the subject of the "dowser;" and made it abundantly clear that his opinion is that faith in such gentlemen is not deserved from their achievements, and that proper knowledge of the geology of a particular district would have secured equally reliable results where success has followed the "diviner" in determining the presence of underground water. In his many-featured address, the President also alluded to what he regards as a sufficient provision in respect of water supply per head of the population; and it brought him to discuss the question of waste prevention. It is still among water engineers a debateable point as to whether the expense incurred in the detecting of waste is justified by the saving. But there can be no doubt that the verdict will be brought to general consent as time progresses, and as the provision of water becomes more difficult. Waste is a thing of continuous growth, and therefore of continuously growing expense. On the other hand, the expense of inspection and prevention has a limit; and it is a logical conclusion that it is better to incur a moderate known expense to save an unknown and ever-increasing one. It is not only the saving that may be accomplished in the present, but the saving of capital and working expense of the future, that should be contemplated in any consideration of the subject.

We must refrain from further comment on the address, and conclude with the remark that the papers read on this occasion, though few in number, were excellent in quality, notwithstanding that the conclusions of one were not of a character that met with general approval. A lecture delivered by Mr. H. F. Cheshire, F.I.C., B.Sc., on "Oxidation "and Corrosion," contained matter interesting to all engineers. The President, Council, Secretary (Mr. Percy Griffith, M.Inst.C.E.), and other officers, are to be warmly congratulated on the success of the meeting, and on the work which was accomplished during the year preceding it.

The Metropolitan Water Board in Trouble.

THE Metropolitan Water Board had not been many months in existence before they found, on the confession of their Chairman, that the management of the water supply of the Metropolis was a rather more difficult business than many people supposed; and they had not been twelve months in actual possession of the works when they found themselves being abused in the Press just like one of the Water Companies whom they had superseded, and whose methods they were supposed to have improved. As already noted in the "JOURNAL," early in the week commencing on the 19th ult., there was what is described, in a report presented to the Board last Friday, as "a shortage of water" (perhaps Mr. Brudenell Carter, who called attention to the matter in "The "Times," would employ less euphemistic language) in the portion of the Lambeth district which comprises Beckenham, Penge, Clapham, Balham, and Tooting. The cause of this "shortage" was the choking of the filter-beds dealing with the water supplied in this area, owing to the turbidity of the Thames consequent upon the heavy storms of the preceding Saturday and Sunday. Everything possible was done by the Engineers, as shown by the report, to cope with the difficulty; and the result was the restoration of the supply on the morning of the 22nd. The incident serves to show that the Board, equally with their predecessors, are liable to have their arrangements interfered with by meteorological conditions; and for this, of course, they cannot be rightly blamed. Their fault appears to have lain in the fact that, knowing that there would be a scarcity of water, no intimation was given of it in the district, so that some could be stored. A point has been made that while the shortage prevailed water was being liberally used upon the roads. This, however, is a matter which rested rather with the Local Authorities than with the Board. One redeeming feature of this unfortunate accident is the recognition by the Board of the inadequacy of their works to meet the requirements of the district, as evidenced by the sanctioning some months ago of an expenditure of £30,000 upon them. Another is that the existence of the intercommunication arrangements carried out by the Water Companies enabled the Board to bring in a supply from the reserve works of the Southwark and Vauxhall system. At the same time, the withholding, for only two days, of such a necessity as water from a large area like that described above, is a very serious business; and though we do not go so far as to characterize it, as a contemporary has done, as an exhibition by the Board and its officials of "indifference to the public "welfare," we think it was a necessity which would have been attended with less inconvenience by the display of a little more promptitude and tact. However, we have the assurance of the Works Committee of the Board that the extensions already referred to are nearing completion; and therefore it may be hoped that no further cause of complaint will arise. By the transfer of the water undertakings to a public body, the consumers have been led to expect better service. The Board must see that they get it, or there is sure to be agitation on the subject.

From Early Volumes of the "Journal."—Aug. 10, 1852.

A project, under the title of the Vegetable Gaslight Company, for the lighting of isolated buildings, mansions, manufactories, railway stations, villages, and small localities generally—where hitherto, from the costliness of gas-works for small consumption, no gas has been obtainable at all—has just been brought forward under respectable auspices; and the singularity of its title has caused several inquiries to be addressed to us relative to it. Its chief promoters are, we understand, manufacturers of camphine from resin, in which process they produce large quantities of a residuary oil, suitable for manufacturing gas of high illuminating power; and there is no doubt but that, if this oil can be supplied at 4d. or 6d. per gallon, it may enter into competition with cannel coal for the production of gas in small apparatus. Mr. Wright examined the subject for English's Camphine Company in January, 1850, and found that the yield of gas was about 100 cubic feet per gallon of oil, the illuminating power being quadruple that of the ordinary London gas of that day. The documents now issued with the prospectuses state that, with larger and improved apparatus, the produce is increased to 150 cubic feet per gallon; and, as the oil is proposed to be supplied by the patentees at 1s. per gallon, the lowest cost amounts to 6s. 8d. per 1000 feet of gas for the oil alone. At Blackpool, the only town in which the gas has been introduced, the works are the property of the patentees, and the charge to the consumer is stated to be 12s. per 1000 cubic feet—a moderate price, considering the quality of the gas and the small consumption. The Boghead cannel is the most formidable rival which the parties who are promoting this scheme will have to encounter—a ton yielding 15,000 cubic feet of gas, superior in illuminating power and equal in purity to that of the Vegetable Gas Company; and, as this cannel costs only 19s. at the port of shipment, and may be delivered at most points throughout England at 30s. per ton, gas may be manufactured from it at a cost for materials of from 1s. 3d. to 2s. per 1000 feet, instead of 6s. 8d. or 8s., which is stated to be the cost of the oil for the vegetable gas.

INLAND REVENUE COMMISSIONERS AND STAMP DUTY ON GAS TRANSFERS.

We have received from Mr. F. E. Cooper, the Secretary of the Gas Companies' Protection Association, a copy of the following questions submitted for the opinion of Mr. W. O. Danckwerts, K.C., with regard to the claim of the Commissioners of Inland Revenue to stamp duty on the change of a company from a non-statutory to a statutory condition, together with his replies.

QUESTION 1.

Are the Commissioners right in their contention that *ad valorem* duty is payable by the parliamentary company under the circumstances mentioned in respect of the vesting in such company of the property of the limited company?

Answer.

In my opinion, the Commissioners, if the case were contested, would succeed in getting their views affirmed by the Courts. There is here a transfer of property from the limited company to the newly-created company. Each company is distinct and each is a different legal entity; and the new transferee company gives consideration for the transfer—viz., in shares to the old shareholders and in meeting the liabilities of the old company. It is immaterial that the consideration does not go to the transferors. This brings the case within the principles adopted in *Great Western Railway v. Inland Revenue* (1894, 1 Q.-B., 507), *Foster v. Inland Revenue* (*ibid*, p. 517), *Ulverston Railway Company v. Inland Revenue* (2 H. and C. 855), *Furness, &c., Company v. Inland Revenue* (33 L. J. En. 173).

QUESTION 2.

If Counsel's opinion on question 1 be in the affirmative, he is requested to advise what is the precise meaning of the words "vested by way of sale" contained in section 12 of the Finance Act, 1895?

Answer.

I think it means a transference from one entity or person to another entity or person for a valuable consideration in money, money's worth (not being an exchange), or shares. See reasoning. in Foster's case particularly.

QUESTION 3.

Also in what way the amount of the consideration on which duty is payable is to be ascertained?

Answer.

The market value of the shares, *plus* the liabilities taken over, constitute the consideration. See Stamp Act, 1891, s.s. 6 and 122.

GENERAL REMARKS.

The difficulty here is caused by the particular *modus operandi* imposed upon the promoters of the Act. A different method might have avoided the result; but no doubt the Inland Revenue representatives would have interposed.

NOTES FROM WESTMINSTER.

The Northumberland Clause. It is now well known in the gas industry that the Board of Trade have completely changed their attitude in respect of the introduction of the Northumberland form of clause for the protection of ratepayers in municipal Electric Lighting Orders—that is to say, in what they consider to be ordinary cases. The Northumberland clause appears in the Hessle Order; and the Hessle Gas Company—a non-statutory concern—obtained *locus* to appear in opposition to the Confirmation Bill before a Select Committee of the Commons, to show cause why the strings of the clause should be tightened by omitting the words "as far as is reasonably practicable" and in other respects. But the Board of Trade will not go to this length; and when the parties appeared before Sir James Woodhouse's Committee the other day, a message came from the Board to the effect that they were strongly averse to the suggested changes. Perhaps, however, it is only a question of time, to bring them round to the opinion of another Committee who the other week insisted on stiffening a somewhat similar clause in the London County Council Bill in respect of electrical wiring and fittings, so as to make it obligatory on those Borough Councils who may take advantage of those clauses to ensure that the income of the business balances the whole of the outgoings. Sir James Woodhouse's Committee refused the changes proposed by the Hessle Gas Company; and they declined almost simultaneously to insert the Northumberland clause at all in the Surbiton Order. In this case, however, the District Council have leased their undertaking to a Company; and the Board of Trade cannot see any reason why the clause should be inserted. But it is difficult to see what harm can be done by such a course; for it may be found useful later on. Perhaps the Kingston-on-Thames Gas Company will try again.

London Electric Power Bills. The South Metropolitan Gas Company made a brave fight against the Administrative County of London Electric Power Bill on the question of non-compliance with the Standing Orders under the circumstances previously explained. They carried the Examiners with them; and the Examiners reported accordingly. The matter has now been before the Select Committee on Standing Orders; and though the Gas Company opposed any relaxation of the forms of the House, the Committee determined to dispense with the Standing Orders unconditionally. The next menace the Bill has to meet is on second reading, when Mr. C. A. Whitmore will move its rejection. From present appearances, there is every probability that the debate will not be made a party one, as, on both sides of the House, the County Council, the Metropolitan Borough Councils, and the Electricity Companies are finding strong supporters of vested interests. Over this Bill there has been an amount of whipping-up by promoters and opponents that must be almost unprecedented in the history of Private Bill legislation. But the tactics of the promoters have included a newspaper campaign of a character that the less said about it the better. For example, in the "Municipal Journal," we find a whole page filled up with what has every appearance of being one of that paper's ordinary articles. One reads on, and thinks that the Editor has suddenly turned a somersault in his policy over bulk supply. But after reading three columns of matter, one feels almost inclined to say rude things on finding after the last word the abbreviation—"Advt." Between the entreaties of the promoters and opponents of the Bill, and the sickly-looking countenance of Big Ben through the experiments that are being made in its illumination by the mercury vapour light, members of the House had quite enough of electricity last week.

Nernst Lights and Economy. About the reference to Big Ben, two years ago it was lighted by gas; but since then Nernst lights have been used. The clock is illuminated for about 4000 hours every year; and will it be believed by the electricians who talk of the economy of the Nernst lamp, that the present experiment is being carried out to see whether some economy cannot be effected?

A Rapid Change. The powers of Select Committees are of a far-reaching order; but though for certain reasons we agree with the effect, it does seem to us that the Committee sitting with Sir James Woodhouse as Chairman last week took upon themselves a great deal of authority in a decision they came to in connection with the Rutherglen Electric Lighting Order. In 1901, it will be remembered by those who are interested in these matters, the Clyde Valley Electric Power Company obtained authority to supply over a considerable area electricity in bulk to local authorities and for power purposes to individuals. Rutherglen is in their district; but the Authority of the burgh and the Glasgow Corporation have not troubled themselves about electricity supply in the town, although Glasgow distributes both gas and water there. Now Rutherglen this session appears, and asks for powers of supply in their own burgh; but the general powers sought had inserted among them a clause permitting them to transfer their powers of supply to the Glasgow Corporation. If Rutherglen had a preference for Glasgow, they, or Glasgow, should have been in Parliament in 1901 with this Order, when the Clyde Valley Company obtained their powers, and not waited for four years before coming to a decision in the matter. Quite apart from such questions as extending municipal trading, and allowing one municipality to do business in the district of another authority, there was a total want of fairness about the transferring clause in the Order of this session. The Commitee agreed as to this; and, learning that the Clyde Company were prepared to supply on the same terms as Glasgow, they substituted in the clause the title of the Company for that of the Glasgow Corporation. The South Metropolitan Gas Company the other day nearly disabled the great Administrative County of London Bill on a question of non-compliance with the Standing Orders through an alteration allowed in the Bill by Lord Camperdown's Committee; and if Committees are to have power, without the consent of all parties, of making changes of the kind referred to, instead of simply accepting or rejecting the whole or particular provisions, or modifying them within their powers, promoters will never know where they are, or are likely to be. The Committee, in this case, took upon themselves the strengthening of the Clyde Company's position in an unexpected manner.

Malvern Water. By a little arrangement, the Water Bill of the Malvern District Council has got through the Commons Committee stage, and will in all likelihood now succeed without opposition to the end. Malvern has not been altogether favoured by Dame Fortune in respect of water. The yield of water from their works has been disappointing; and they have had to have recourse to certain expedients to keep things going. In their Bill, they ask to have their expenditure for this purpose legalized, and to be authorized to carry out further works—the cost of the whole scheme being estimated at about £20,522, which Mr. E. K. Burstal (Messrs. Stevenson and Burstal) says is a very reasonable amount. The period of repayment is put at 60 years for the emergency works, and 50 years for the authorized works. The Parish Council of Colwall were the only petitioners; and they obtained *locus* because the Malvern people had not complied with a clause in their Act of 1896, which provided for a supply to the inhabitants of Colwall, by means of a

stand-pipe, at a low rate per head per day. A very satisfactory clause was agreed upon by which Malvern will within a year of the passing of the Act lay a pipe into Colwall, supply 1000 gallons per day for public purposes, and give a supply for domestic purposes limited to 20 gallons per head. The Colwall Council, in their turn, guarantee 5 per cent. on the outlay for six years. In the agreement, it was reckoned that the pipe to be laid would be about ¾ mile long; but since it has been discovered that it will be 2¼ miles long. It has been agreed to rectify the error in the next House.

Mansfield Water. After its safe passage through the House of Lords, the "Omnibus" Bill of the Mansfield Corporation, which contains an important part (as previously indicated) referring to a new water scheme, soon got before the Police and Sanitary Committee of the Commons; and it has received their approval. The scheme may now be regarded as perfectly safe.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 57.)

LAST week, from a Stock Exchange point of view, was somewhat mixed, though not as bad as its predecessor. After a dull opening on Monday it turned a shade better, and continued to improve very gradually, as a solution of the Moroccan difficulty seemed nearer. But then up sprang the Odessa alarm and heavy sales in Paris, which upset the market here, and produced difficulties and failures over the fortnightly settlement. However, before the close of the week the feeling was less apprehensive, and a somewhat more cheerful feeling prevailed. In the Money Market, there was a strong demand up till the turn of the half year, when a condition of marked ease supervened; and hopes are being built upon the prospect of this state of things continuing. Business in the Gas Market was not so active as it had been the week before; but it was fairly well distributed about the list and not confined to the big issues. Changes in quotation were to a large extent the result of *ex div.* adjustments, while the rest were rather irregular—there being about as many one way as the other. In Gaslight and Coke issues, the ordinary was moderately active on most days, but it had an easier tendency. The best figure realized was 99½ on Monday, from which point it slowly weakened and touched 98½ once on Friday, though Saturday's were better again. There was not much business done in the secured issues, and prices were not remarkable. The maximum changed at 92¼, the preference at from 109½ to 110¼, and the debenture at 89½ and 90¼. A moderate amount of business was done in South Metropolitan at practically the same prices as those marked the week before. The best figure was 129½; the lowest 128½. Commercials were quiet again. One bargain was done in the 4 per cent. at 116, one in the 3½ per cent. at 112, and one small lot of debenture was done "free" at 85½. The Suburban and Provincial group was less active than the previous week, but some nice advances in value were effected. Brentford old rose a point, and was done at 250; and ditto new rose three points, and was done at 190. In Bournemouth "B," there were dealings at 16½ and 16¾; and in British at 40⅜. South Suburban preference rose 2, and Wandsworth debenture 1; but Alliance old and Wandsworth debenture were each half-a-point easier. The Continental companies were on the whole quieter. Union was the most active, with business in the ordinary marked at from 108½ to 109¾, and in the preference at 138 and 138¾. Imperial was very inactive, with business done at from 212 down to 210; the quotation dropping a point. Among the undertakings in the remoter world, Bombay new marked 5⅛, and Cape Town preference 10⅛. Primitiva ordinary was done at 5⅝, and ditto debenture at 96¼. River Plate marked 12 and 12⅛, and ditto debenture 99. South African changed hands at 16 and 16⅛, Hong Kong at 18 and 18⅛, and Melbourne 5 per cents at 102½.

The closing prices are shown in our Stock and Share List on page 57.

When referring last week to the new members admitted to the Société Technique at the recent congress, Mr. H. F. Andresen should have been described as *the* (not *an*) Assistant-Secretary of the Imperial Continental Gas Association. No other official has a like designation.

The Town Council of Aberdeen have adopted a minute expressive of their regret at the death of Mr. JAMES TAIT, the Assistant Superintendent in the Corporation gas-works, who had been for 31 years employed at the works, and who, it was stated, had been "a valued public servant, faithful to his duties, and greatly beloved by the workmen under him."

The Directors of the Cupar Gas Company have placed on record their deep sense of the loss the Company have sustained by the death of Hon. Sheriff-Substitute GRAY, one of their number, and who was Chairman of the Company in the years 1900-02. The Company, it was stated in the minute, had "lost one of their most useful supporters, the community an outstanding townsman, and each Director a good friend."

ELECTRIC LIGHTING MEMORANDA.

The Gravesend Electricity Accounts—Miracles in Economy—How a Financial Balance is Obtained at Taunton—Disproportionate Increases in Public Lamps and Consumption—Literature for Consumers—Accidents at Generating-Stations and Other Factories.

ON rare occasions we are favoured with copies of the accounts of municipal electric lighting undertakings; and when they come to hand, it is only courteous (so long as the number does not grow beyond our space capacity) to give them a little special attention. The electricity accounts of Gravesend and Taunton have been received within the last few days; and both cover the financial year ending March 31. Those of the Gravesend Electricity Department bear, *primâ facie*, a general result (for a second year's working) over which one would be disposed to congratulate the Corporation and the ratepayers; but, when they are scrutinized for the purpose of ascertaining how it comes about that a deficit of £2891 at March 31, 1904, has been turned, in the short space of twelve months, into a profit balance of £29, after satisfying the demands of interest and repayment of principal, there are several things that require explanation before being generous with congratulation and praise. The increased business alone has not made all this difference; and it looks very much as though a considerable part of the "improvement" has been obtained by an almost all-round cutting down of the expenses on revenue account, in a manner which is hardly consistent with the increased business shown on the other side of the account. Either there was scandalous mismanagement the first year, or in the past year—well, let us put it another way. The overlapping of municipal work, it is known, is ofttimes made the excuse for helping the weak at the expense of the stronger departments or of the ratepayers; and sometimes, too, revenue is aided by benevolent charges being made against capital. These are things that an outsider cannot determine. Knowing that such things do happen, one cannot get rid of a little feeling of mistrust when accounts such as the Gravesend Electricity Department's are examined. Dealing with the revenue account first, the receipts from all sources for current amount to about £1295 more than the preceding year, which does not make up half the deficiency on the first year's working. It is noted that the rent of meters and other apparatus has only increased by £14, so that not much progress has been made by getting new consumers. About £800 of the increase was obtained from private customers, about £300 from sales under contract, and £200 more from public lighting. But we can only find that the number of public lamps—whether arcs or incandescents the accounts do not show—has increased by 19. The Corporation are evidently finding that public lighting by electricity is not a bad way of supporting the Electricity Department from the purses of the ratepayers. Adding the receipts from private and public lighting together, the total only amounts to £3910. Of this, public lighting contributes £1042; and yet of the total number of public electric lamps, the incandescents have a considerable majority. We hope the ratepayers are satisfied with their performance at the price paid.

Coming to the expenditure, there have been miraculous happenings during the year, in the way of cutting down the charges made against the department's revenue account. Although there has been the improvement of £1200 odd in the business done, we make out that the expenditure has been lessened by about £2500. On coal, there has been a saving of about £526, and on stores £44. Of course, these are items always subject to fluctuation. For repairs and maintenance (taking the several charges together), only £363 is entered; whereas in the *first* year's working (1904), £946 was charged. Why was this heavy amount necessary in the first year when the plant was brand new, and only such a small sum in the second? Seeing that there are now 184 public electric lamps, £19 for attendance and repairs is an extraordinarily modest sum to charge for a twelvemonth. The renewals of the public lamps amount to £44. The Department are to be congratulated on the generosity of the rating authorities towards them. The total capital expenditure now amounts to £49,709, and £9456 of this was spent last year. The rents, rates, and taxes this year amount to only £103; in the preceding year, they were £10 more! We wonder if this is the kind of treatment that the Gas Company and the other ratepayers of Gravesend receive; if it is, we sincerely compliment them. Any way we do not know of another electricity undertaking with a capital expenditure equal to that of Gravesend whose rates and taxes are so low. But what is even more remarkable, the charges under the heading of management have dropped from £1812 in 1903-4 to (including £68 for insurance) £520 last year—a saving of about £1300. In this connection, it is observed that the Engineer and his department only receive £250 for the year; and the Accountant and clerical staff, only £97 5s. Engineer, Accountant, and staffs have our profound sympathy. Manifestly there are shrewd men on the Gravesend Electric Lighting Committee who know how to make their accounts balance to a nicety. Concerning the capital account, the expenditure is going on at a good pace; and the Committee will, unless business is now increasing at a remarkable rate, again have to set their wits to work to make the finances balance next year. The past year was the second one for the undertaking; and yet in that period £9455 18s. was spent on capital account—this being nearly 25 per

cent. on the capital expended at March, 1904. The Department deserve a rebuke from the Local Government Board; for on March 31 last, the capital outlay exceeded the sanctioned loans by about £2500. There is nothing in hand in the way of a reserve or depreciation fund. Incidentally, it may be mentioned that the quantity of electricity used on works and unaccounted-for is above 20 per cent. of the total generated. Before the Gravesend Corporation are granted further borrowing or other powers for electric lighting, it is clear that their accounts should receive very strict investigation; for on their face some of the charges are too ridiculous for any intelligent person to accept.

From the exquisite refinements in expenditure as practised at Gravesend we turn to the Taunton accounts to find entertainment in observing how this municipal department screws and scrapes to make the accounts present a profit. But although the concern has been at work now some fifteen years, it cannot—even by the aid of the profit of £107 on sundry installations of apparatus and incandescent lamps, even (to the discredit of the department) by taking credit in the net revenue account for part of the premiums received from pupils (£87 10s.), and even by taking an exorbitant amount from the ratepayers for public lighting—show a profit on the past year's working. The position amounts to this, that if we deduct the extraneous items of £107 profit made on the installation of fittings, and the pupils' premium of £87, and add to them a sum of £62 that has to be taken to balance matters from the £83 brought from the last account, it is found that there has been an actual loss on production and sale of current (after meeting capital obligations) amounting to £257. This is the result of the working of a municipal undertaking the capital expenditure on which at March 31 last stood at £64,953, or £1453 more than the loans sanctioned. We have mentioned public lighting; and, in the district rate account, it is seen that the payments for this service amount to £2645, which exceeds 7½d. in the pound. Of the £2645, £2097 was received by the Electricity Department—in other words, the public lighting is costing to-day at least £1000 a year more than it ought to do. There is a matter about this public lighting that, from the accounts alone, one cannot fathom. In 1895, there were 52 arc lamps in use and electric incandescent lamps equivalent to 266 of 8-candle power. These lamps during that year consumed 47,546 units of electricity. In 1904-5, 20 additional arc lamps were in use, and additional incandescents equivalent to 314 of 8-candle power. But the consumption of electricity has risen from the 47,546 units of 1895 to 142,340 in 1904-5. There is something inscrutable about this on the accounts alone. It is, however, a fine thing for the Electricity Department that, by increasing the arc lighting by less than one-third, and doubling the nominal candle power of the incandescent light, they should be able to increase by 200 per cent. the volume of their public lighting consumption. This disproportionate increase in the number of public lamps and in the consumption requires explanation; but meantime we cannot resist thinking the ratepayers of Taunton are an extremely docile people. On the other hand, the electrical power business in Taunton is not a thriving one. It was started with a great flourish of trumpets three years ago, and already shows a falling off last year of upwards of 20 per cent. The sale of current for power, at 2d. per unit last year, brought in £391; the previous year £472—a decrease of £81. The Taunton Gas Company are to be congratulated; for we make out that the power business the Corporation Electricity Department has succeeded in retaining, after great exertion, is only about 2½ per cent. of the total of the Gas Company's output, taken on the cost equivalent per million cubic feet. One or two words about the consumption. Last year the increase in the quantity of units sold was less than ½ per cent.; and the quantity used on the works (126,354 units), and lost in the mains, transformers, &c. (130,450 units), together equalled 48 per cent. of the amount sold. There is surely room for some economy and improvement here. After their considerable working life, the department has only succeeded in amassing a reserve fund of £1400, and no depreciation fund. Altogether, it is impossible to look upon the prospects of the undertaking as hopeful; and as to the figures to which we have called attention, the ratepayers should seek a little knowledge.

The commercial awakening in the electricity supply industry has of late been responsible for the dissemination of a large amount of literature among householders in the shape of circulars and tracts. Correspondents in different parts of the country have favoured us with samples. We find in them that the commercial awakening has not been accompanied by any ethical improvement. In not a single sample of the literature that has come to hand has the writer had the honesty or grace to base his comparisons on incandescent gas-burners. This lapse would be humorous, if it were not that the deceptive and dishonourable practice has the effect of successfully laying by the heels some gullible people. The old flat-flame burner did good service for the gas industry until a better burner came along; and now that the gas industry has discarded the former, and their customers are also fast doing so, it is doing good service, among the less intelligent of householders, as the tool of the electrical industry. Among the pamphlets that have recently been delivered to this office is one distributed by the Dover Corporation Electricity Department; and we accuse that department of deliberately misleading the people of Dover. The composer of the delicate brochure compares 16-candle power incandescent electric lamps with flat-flame gas-burners; but he has not the courage to put forward figures in comparison with incandescent gas-burners. We commend to the notice of the Dover Electricity Department the last paragraph of an editorial article this week headed "Competition Within and Without."

The variations in the computations of electricians are getting almost confusing. The Dover writer calculates that 20 16-candle power incandescent electric lamps can be maintained for one hour on a unit of electricity; but he estimates that only 7 units are required to equal 1000 cubic feet of gas. The South Wales Electrical Power Company state, in their advertisements, that 12 units are the equivalent of 1000 cubic feet of gas. Twelve units at 5d. at Dover would represent 5s., instead of the 2s. 11d. which 7 units represent, and which conveniently makes the incandescent electric light equal in cost to flat-flame gas lighting, taking the Dover electrician's figure of 7 cubic feet of gas consumed in a batswing burner as being equal to 16-candle power. Let us do the proper thing, and take the Dover figure of 20 16-candle power incandescent electric lamps (supposing them to be doing full duty) as maintained for an hour at an expenditure of 1 unit of electricity at 5d. Then 20 lamps × 16 candles = 320 candles for 5d. For 3½d. 100 cubic feet of gas can be obtained in Dover, which will maintain 30 ordinary incandescent gas-burners for one hour, each consuming between 3 and 3½ cubic feet, and each giving a light of about 50 candles. Here 30 × 50 = 1500 candles for 3½d., against 320 candles for 16-candle electric incandescent lamps at 5d. We invite the attention of the inhabitants of Dover generally and of the author of "Some Electric Lighting Points" particularly to these figures, and ask for the latter gentleman's criticism. He has allowed nothing for replacements of electric incandescent lamps; nor have we for mantles. He may feel that the figures for gas show a pretty broad margin for this, while his figures for incandescent electric lamps show an ugly *minus* marginal quantity. Perhaps he will tell us; perhaps he will not.

The annual report of the Chief Inspector of Factories and Workshops includes one by the Electrical Inspector of Factories (Mr. G. Scott Ram). The report is a long one, and can only be touched upon lightly here. From it we learn that, in connection with public supply electricity stations, there were in all during 1904 167 non-fatal and 9 fatal accidents reported, of which 134 and 6 respectively were non-electrical. The number of reported electrical accidents (36) in the stations does not appear to be great; but Mr. Scott Ram states that they were nearly all of "a severe nature," and there were three fatalities, as against none in 1903. Those occuring during ordinary routine work were mostly due to arcing of switches and fuses. He comments on the risk attending work on live switchboards, even though precautions are taken; and with regard to the accidents at switchboards "supposed to have been made dead," though these were few, they were serious—two being fatal. The Inspector treats at some length on the question of electricity station fires. In his remarks, he points out that electrical fires sometimes appear to attain serious proportions almost instantaneously; but there are no doubt plenty of cases where they proceed gradually from small beginnings under conditions where the inflammability or otherwise of the insulation of the cables might readily make all the difference between disaster and a trifling breakdown. As the result of his inspection of electrical installations in factories, he asserts that the dangers met with are due principally to unprotected conductors and apparatus, to badly designed accessories, and to careless workmanship. It is not news to read that they are frequently primarily traceable to the cutting of prices by the firms tendering for work. In the concluding part of the report, Mr. Scott Ram shows distinctly that the fatal accidents of the year—occurring as they did under widely different conditions of system and pressure—prove that, unless proper precautions are taken, any system of pressure may be dangerous. Fatal shocks occurred at pressures ranging from 10,000 volts to 200 volts. In most of the cases which he investigated, the victims were found, by post-mortem examination, to have been of sound constitution, and the usual "excuse" of a weak heart contributing to the fatality was not borne out. Some of the non-fatal accidents were of a very serious nature, involving permanent injury in some of the cases.

Many of our readers are doubtless aware that Mr. C. E. Brackenbury, Assoc.M.Inst.C.E., is a student at the Middle Temple, having entered early last year. He has already passed two examinations, and is now reading for his final. Having decided to give his whole time to the law, he has resigned his connection with the Continental Union Gas Company, Limited. We believe his intention is, in due course, to practise at the Bar; and he will naturally specialize in those branches of engineering with which his name is familiar—more particularly, of course, in gas. That he has unquestionable aptitude for dealing with legal subjects has just been evidenced by his success in the second prize essay competition of the "Law Students' Journal," in which his essay on "The Object, Effect, and Practical Working of the Bankruptcy Acts" was adjudged the best of the seven sent in, and its author was awarded the prize. The essay appears in the current issue of the above-named publication. According to the homely saying, change of work is as good as play. From engineering to jurisprudence is a change indeed; and we trust it may be attended by the good results which are hoped and expected from it.

THE NEW HELE GAS-WORKS OF THE ILFRACOMBE GAS COMPANY.

FIG. 1.—REMOVING OLD BUILDINGS ON THE SITE OF THE RETORT-HOUSE AND COAL-STORE.

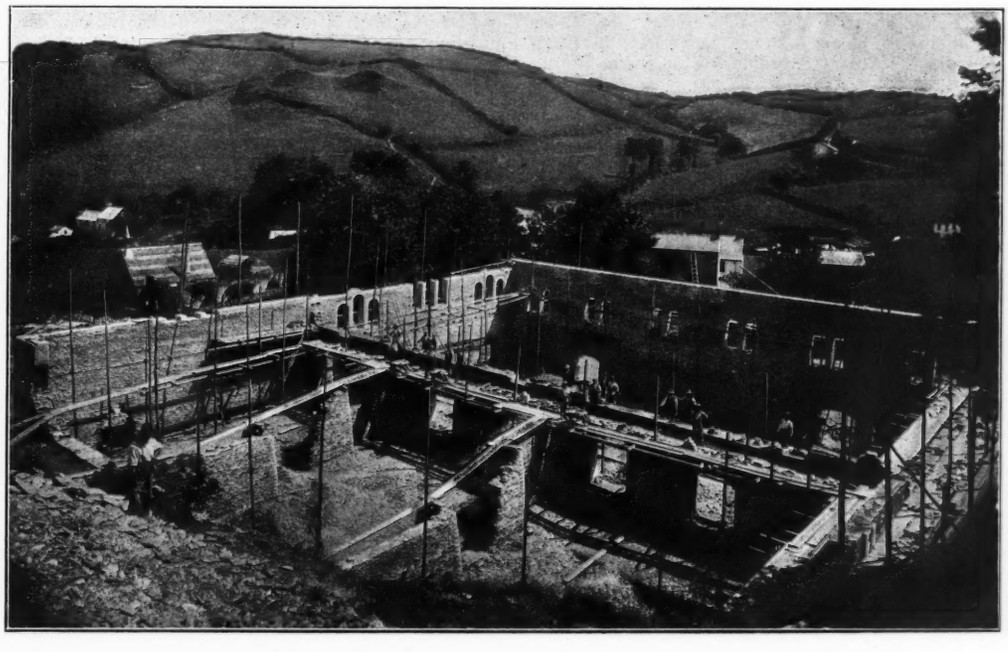


FIG. 2.—THE COAL-STORE AND RETORT-HOUSE FROM THE ROADWAY.

WHEN a new site has been acquired by a gas company for the purposes of their manufacturing operations, and they have actually built upon it a complete new works, the mind of a writer entering upon the description of those works has a natural tendency to dwell upon their several pleasant associations—past and present; and it is even permissible for him, upon the positive evidence of the present, to picture a continuance of the gratifying prosperity in the future. What is it that brings about the purchase of the new site; what is it that on the site brings into being an entirely new gas-works? The answer is centred in the one single word—"Prosperity." The business has outgrown the original site and its available environment; and the necessities demand more ground and larger works. While this means a considerable expenditure of capital (the gas consumers should not overlook this), it is a pleasant reflection for the shareholders that it is the inevitable accompaniment of the vigorous growth of their undertaking, and that the vigorous growth in this case means not enervation but the amassing of strength. And the same set of circumstances—leaving works where manufacturing operations were carried on under crowded conditions, and with plant that time and long service have perhaps brought to the state in which the highest possible efficiency and economy for works of the size cannot be attained, for works designed and built on some of the best of modern principles for the extent of productive requirement, together with, it may be, a more convenient situation for dealing with incoming and outgoing materials—permits them to look, if not immediately, anyway when the works and men after a period have settled down into a common routine under the new conditions, for economical advantages from their enterprise in the future. Therefore, the Ilfracombe Gas Company in possessing complete new gas-works, which it is our pleasure to describe to-day, may regard them as a monument to past and present prosperity; and as the hopeful foundation for still greater things in the time to come. Upon the completion of the first section of the works, we may congratulate the Chairman (Mr. R. Lake), his colleagues, and the shareholders, and not less heartily the Engineer and Manager (Mr. C. E. Ball), upon whose shoulders has, of course, during the construction of the works, devolved great responsibility. Upon the faithful manner, too, in which the Contractors, Messrs. R & J. Dempster, Limited, have discharged their obligations, there must be a word of praise, though the name of the firm itself is indicative of the substantial and well-finished character of their work.

PROGRESS AND ANTICIPATIONS.

We have to go back to 1837 to find the inception of the Ilfracombe Gas Company; and between then and 1872, it is seen, the history of the concern was a somewhat uneventful one. But in 1872 came a change in their status; for they then approached

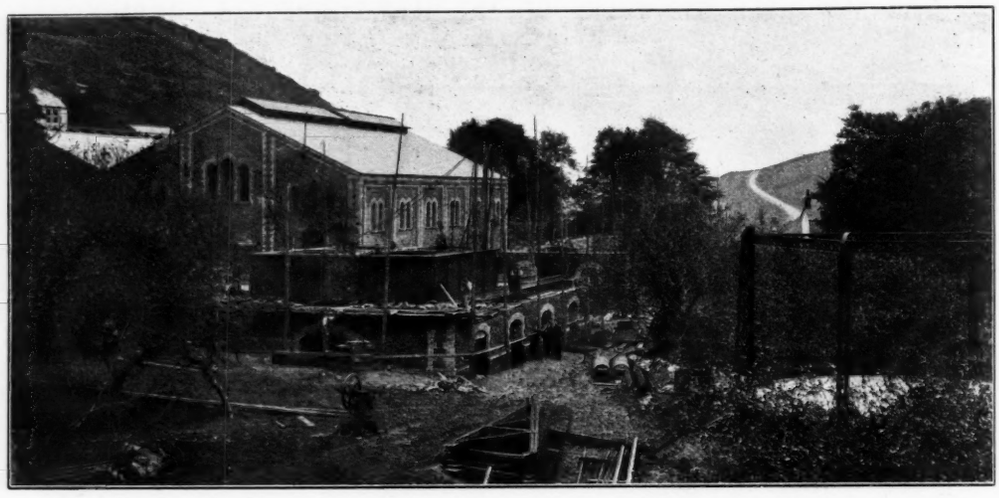


FIG. 3.—THE RETORT-HOUSE, PURIFIERS AND HOUSE, AND WATER-GAS RELIEF HOLDER.

Parliament for incorporation and statutory powers, and their request was granted. Passing over the next decade, it is seen that the output of gas in 1882 was only 12,914,500 cubic feet; but ten years more witnessed progress up to 28,575,000 cubic feet. Between 1892 and 1903, the Company, in common with the gas industry generally, enjoyed substantial prosperity—the make of gas reaching in the latter year 50,546,800 cubic feet, which meant nearly doubling the business. On Dec. 31 last, the Company were supplying gas to 1116 ordinary consumers, and to 975 under the prepayment system. Some 700 cookers had also been connected, and 338 public lamps were under supply. As we shall show presently, the prospects for a continuance of material advancement are excellent; and the provision made for extensions of plant on the new site clearly indicates the anticipations of the Chairman and Directors and their chief official adviser.

THE OLD WORKS AND THE NEW SITE.

The progress of the Company's business which is outlined by the increasing consumption of gas has already furnished one reason for the necessity for new works; and a very few words of explanation will bring into view the reason for works on a new site being essential rather than attempting to do anything more on the site that has sufficed for the purposes of the Company up to the present. The old works are at the junction of Church Street and Wilder Road; and the original site, together with its accretions by the acquisition of adjoining property as it became available, only extends at the present time to about ¾ acre. Upon this site, in addition to the works, are two shops and dwelling-houses, four cottages, and the Company's show-room and offices. We have shown how in 1892, the make of gas was speeding upwards; and two years later, the Directors evinced great prudence and foresight (for which to-day there is cause for much thankfulness) when they decided that the time had come—there being no possibility of acquiring more ground for extensions in Church Street—having regard to probable future increases, to look about for another site for works. The growth of the business in the ten years that have since passed is the full justification for their course of action betimes. It so happened that in July, 1894, the Hele Estate, comprising about 45 acres, came into the market. As in this estate was included almost the only piece of ground within a radius of several miles upon which a gas-works could be erected, the Directors purchased it by private treaty; and in 1896 the Company went to Parliament for powers to enable them to erect new works upon a portion of the site. Incidentally, it may be mentioned that some 6 acres of the ground have been retained by the Company; the remaining part has been sold on advantageous terms.

We must leave a reference to the features of the site for the moment, in order to point the influences that ultimately led to the utilization of the site. It has been seen that by 1903 the output of gas had reached 50,546,800 cubic feet, and in that year the land that had been secured in good time had been in the Company's possession for some nine years. The annual consumption, the maximum day's make of 201,000 cubic feet, the size of the area, the property that it accommodated in addition to the gas-works plant, will sufficiently indicate that work on the old site was in 1903 being carried on under cramped and strained conditions; and therefore it was that the Directors decided not to further delay the erection of the new works. Sufficient though the circumstance already mentioned was for the determination of the Directors, it was not the only influence. Another, though perhaps of less moment, was the fact that, by their 1896 Act, the Company had been conceded the right to light Combemartin, and that concession was due to expire in May, 1904. Combemartin is 4 miles from Hele, and has a population of about 2000. Therefore it was to the interest of the Company not to allow this township to slip from them through any default. Another important consideration was that the Ilfracombe District Council decided to give a five years' contract to supply gas to all the public lamps and buildings if the works were removed, and (subject to the approval of the Board of Trade) to purchase the site of the old Church Street works.

It is convenient to mention here that, to provide capital for the erection of the new works and for the Combemartin extension,

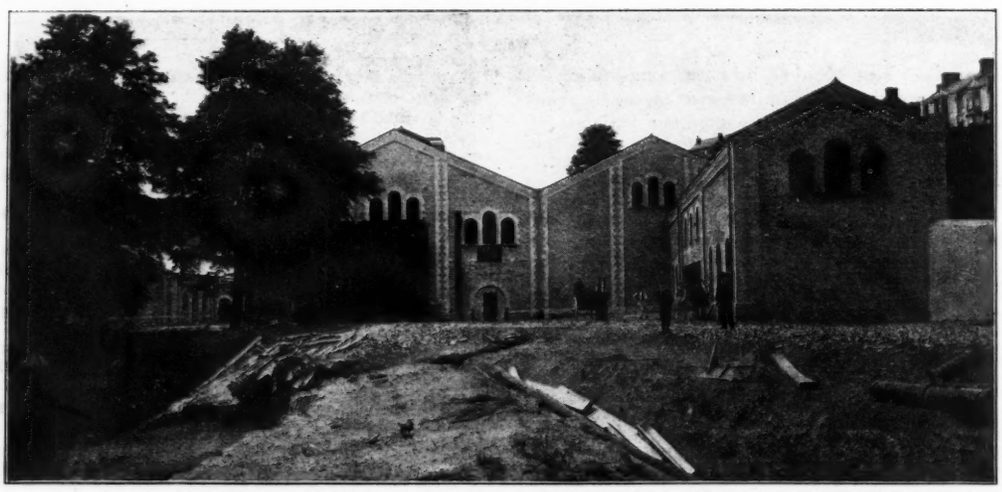
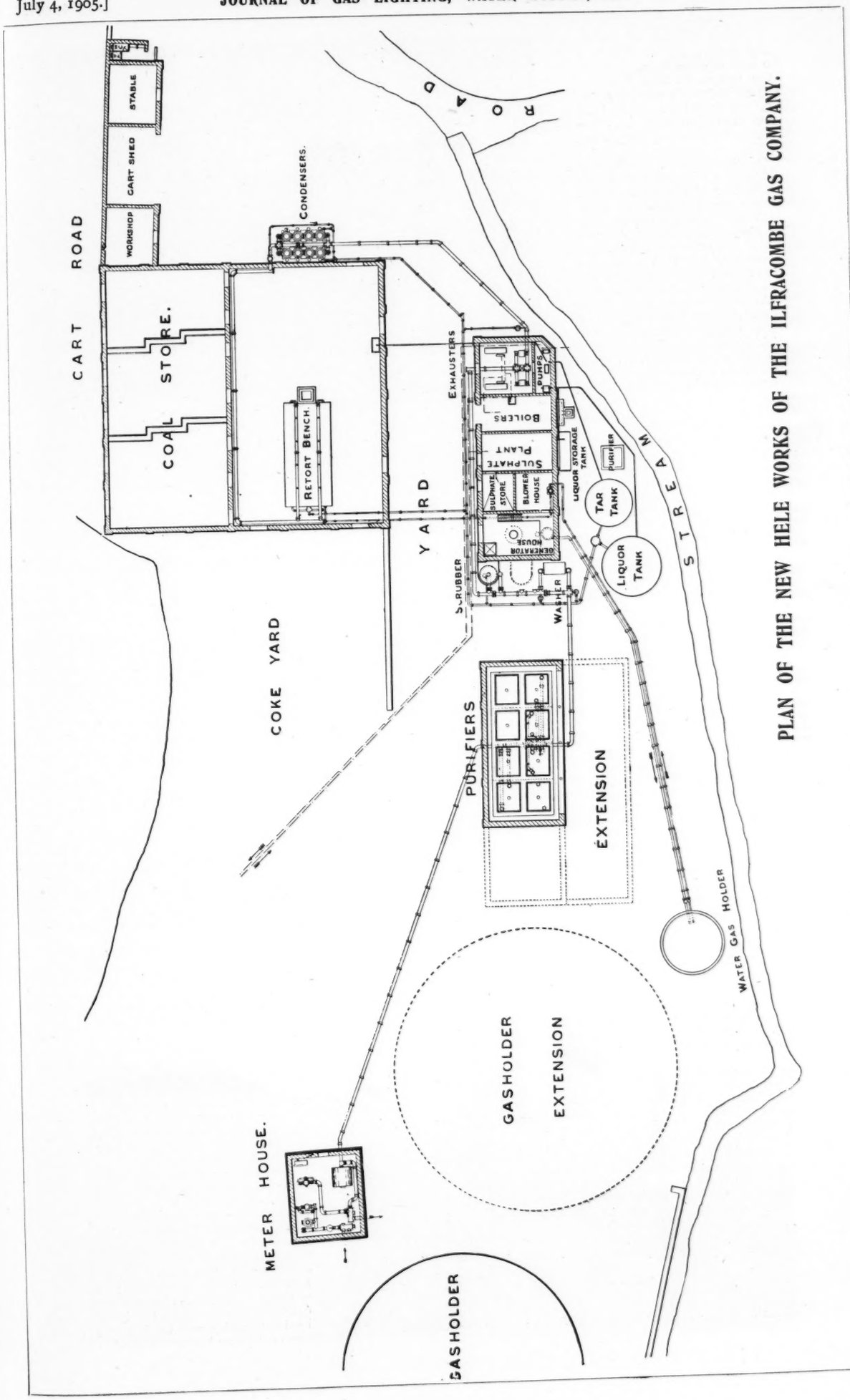


FIG. 4.—GENERAL VIEW FROM THE MAIN ENTRANCE.



PLAN OF THE NEW HELE WORKS OF THE ILFRACOMBE GAS COMPANY.

the Company issued £10,000 of consolidated ordinary stock; £4000 has been raised by the sale of 4 per cent. mortgage bonds, and the two shops and dwelling-houses, and the Company's existing show-rooms and offices have been sold. It is the intention of the Directors to erect new offices and show-rooms during the present year.

Reverting to the new site, it will have been gathered that its selection was almost, if not quite, a matter of Hobson's choice. The district is not one that offers an ideal place on which to locate gas-works; and therefore the next best thing to do was naturally to take the site that offered the greatest advantages, and that those gas engineers who are best acquainted with the district will, we think, concede the Directors have done. As indicated, the land which the Company reserved for their works out of the estate has an area of about 6 acres; and it is situated at Hele on the Combemartin Road, about ¼ mile from the beach (rights over which have been acquired by the Company), so that the works are not badly located for the delivery of coal. The works are 2 miles from the Railway Station, and an equal distance from Ilfracombe Harbour.

Most gas-works sites have peculiarities of their own; and this one in its configuration has characteristics which perhaps make it unique among gas-works sites. It is almost triangular in shape, is bounded on one side by the Combemartin Road, for the most part on the second side by a fresh-water stream, and on the third side by pasture land. The site is a very hilly one, and is quite typical of North Devonshire and the Ilfracombe district (see figs. 1, 2, and 3). The roadway bounding the site at the highest point has an elevation of over 100 feet above the main entrance to the works; while the bed of the stream at the lowest point is about 15 feet below the entrance. Reference to some of the views will show what a sharp rise—about 1 in 4—there is from the coke-yard and the large holder to the roadway. As this portion could not be conveniently used in setting out the works without entailing a large expenditure in excavation and retaining-walls, it has been left undisturbed, and reserved for gardens for the gas-works' employees. The portion of the site occupied by the new plant has been levelled with the material excavated in forming the coal-stores and the foundations. Part of the ground was well covered with large trees; and the remainder by an apple orchard and the ruins of an old-time inn. Looking at certain of the photographs, some readers may be disposed to think that it was almost tantamount to desecration to set up gas-works upon such a site; but in a district where natural beauty abounds, a part of it must give place to the convenience and service of mankind. It is noticed that the large elm and other trees on the ground have been left undisturbed as far as possible; and a number of new trees have been planted along the west side of the works. These latter in a few years will completely hide the works from the roadway.

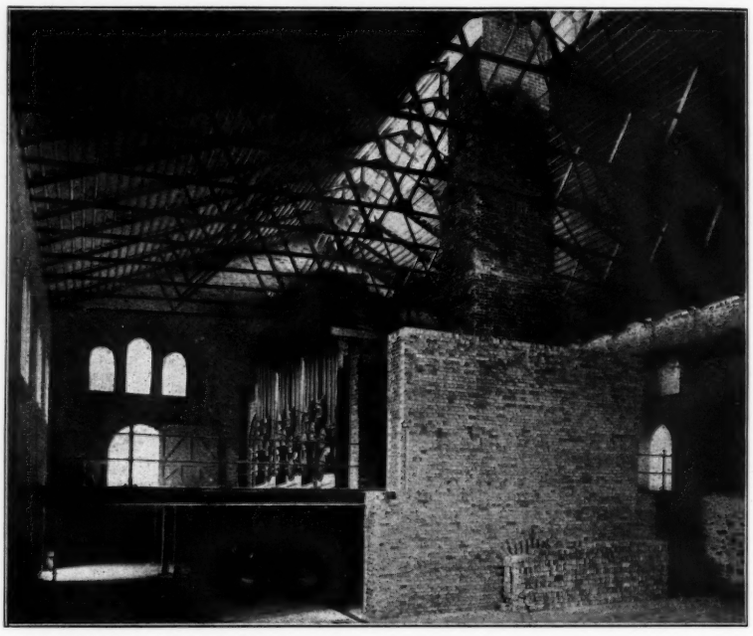


FIG. 6.—INTERIOR OF THE RETORT-HOUSE, SHOWING THE PREPARATIONS FOR THE EXTENSIONS TO THE RETORT-BENCH.

THE SCHEME OF THE NEW WORKS.

Before passing to detail, attention may be called to the general scheme of the works and buildings. The works were designed and laid out by Messrs. R. & J. Dempster; and as stated in the opening paragraph, they were the Contractors for the supply and erection of the whole of the plant. The buildings and foundations were executed by Mr. Upton, of Ilfracombe, under the superintendence of the Company's Engineer and Manager (Mr. C. E. Ball). The works have been designed for the production of 250,000 cubic feet of coal gas per twenty-four hours; and preparations have been made for duplicating this output. In addition, an installation of Dellwik-Fleischer blue water-gas plant has been made, with a daily capacity of 125,000 cubic feet; so that the total present capacity is 375,000 cubic feet.

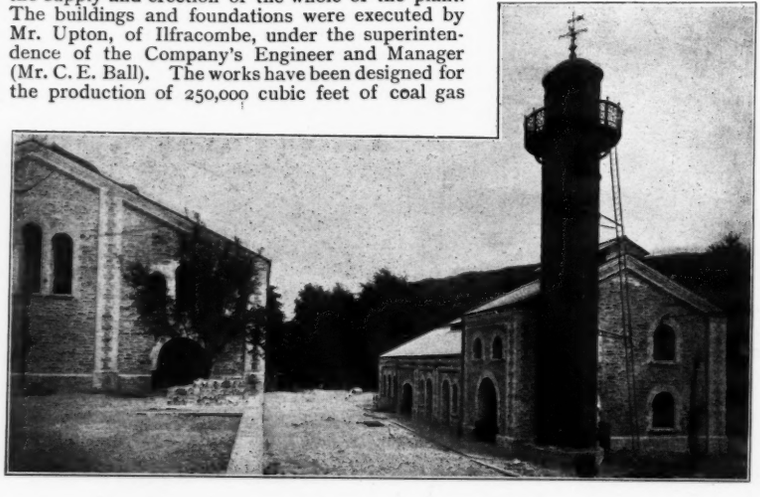


FIG. 5.—THE SCRUBBER AND BUILDINGS, SHOWING THE ELEVATED COKE YARD.

As seen by the general plan, there are four separate blocks of buildings—viz., (1) The retort-house, coal-stores, stables, and workshops; (2) the exhauster, boiler, sulphate, and water-gas plant houses; (3) the purifier-shed; and (4) the meter and governor house. The latter, it may be mentioned, was built in 1896 at the time that the large gasholder was erected.

We need not say much about the general character of the structures. They are of substantial build, and harmonize in their main features. Throughout the buildings, local blue rubble stone, set in lime, has been used; and the corners, plinth courses, eaves, set-offs, door-ways, windows, and openings are faced with Marland bricks, and the roofs covered with blue slates. The floors are all of concrete, except the upper ones of the retort-house, which are of blue brick and cast-iron plates.

The retort-house and coal-stores are 103 feet long, by 63 ft., and 50 ft. wide inside respectively; the exhauster-house block is 90 ft. long by 30 ft. wide; the purifier-shed is 65 ft. long by 30 ft. wide, and the meter and governor house 37 ft. long by 27 ft. wide. The stables are prepared with stalls for four horses with hay-loft overhead, and cart-shed alongside. The workshop and smithy are between the coal-store and cart-shed.

DETAILS AND EQUIPMENT.

THE COAL-STORES.

The foregoing conveys a general idea of the scheme; but now we may pass into each building individually, and note its most pronounced features. It is first observed that the coal-stores have been made specially large, for reasons which will be explained; the capacity being from 1200 to 1500 tons. The approach to the back of the coal-stores is by an inclined roadway elevated about 12 feet above the coal-store floors, and arranged so that the coal is tipped through openings in the walls close to the eaves of the buildings. The floor of the coal-store is almost level with the charging-floor of the retort-house; and the coal will be wheeled in barrows from the store to the charging-floors. There are, it is learned, two good reasons why the stores have been given plenty of capacity—the first being to save expense; the second to, as far as possible, tide over periods when supplies cannot be delivered at the works in the cheapest manner. It is intended, under normal working conditions, that the coal shall be delivered from ports in the Bristol Channel by boats which will be beached at Hele; the coal being there unloaded, carted, and put into store for about 10d. per ton. The alternative method is the more expensive

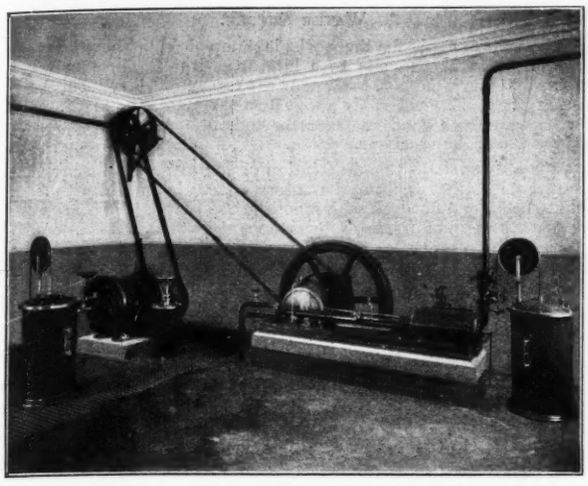


FIG. 7.—INTERIOR OF THE EXHAUSTER-HOUSE.

one. Weather not permitting the beaching of the boats at Hele, the coal will have to be taken to Larkstone; and the tolls and dues, together with the extra cost of cartage, will add about 8d. per ton to the expenses. During the equinoctial gales and the winter months, the boats cannot be beached with safety. Hence it is that the coal-stores have been made specially large; so as to take advantage to the utmost of the cheaper method of getting the coal to the works. It is hoped that only on very rare occasions will the more expensive method have to be resorted to.

IN THE RETORT-HOUSE.

When the retort-house is entered—one of our photographs shows this well—the first thing remarked is the ample provision that has been made for future extension without incurring considerable outlay; and it is also seen that convenient arrangement has been made in the retort-bench so far constructed to allow of ease in working according to the seasons. The bench consists of four arches, two of which are filled with seven oval ⌂ retorts, 22 in. by 16 in. by 20 ft. long, with one furnace to each through setting. The third arch contains fourteen retorts 9 ft. 6 in. long—that is to say, seven at each side, set back to back—with a separate furnace to each setting. The fourth arch is empty at present. The chimney is in the centre of the building. It is noted that the settings are on Winstanley's deep regenerator system, with an elevated stage-floor. Each arch is provided with a separate length of hydraulic main, fitted with separate tar and gas take-offs. At the end of the bench is a deep tar-tower, arranged for flushing and draining, and to this tower is also fixed a weir-valve, which seals the dip-pipes evenly in the whole of the hydraulic mains. The gas is carried along the top of the bench in two 12-inch diameter pipes, coupled to a 16-inch steel foul main, running along two ends and one side of the retort-house, and delivering to the condensers.

In conjunction with the retort-house, it may be here conveniently mentioned that the coke is wheeled from the stage-floor to the coke storage yard, both of which are on the same level. For removing the coke from the works, carts draw up alongside the wall of the coke yard and the coke filled in; the top of the cart being just about level with the coke yard, so that the loading is easily done, and, when convenient, is tipped direct from the barrows into the carts. In several ways, it is observed, the variations of the level of the site have been made to serve in the economy of working.

CONDENSERS, EXHAUSTERS, AND SCRUBBERS.

Following the course of the gas, the condensers next claim attention. These are of the annular type, eight in number, set in two rows of four; each condenser being 21 feet high, with inner and outer tubes 3 ft. and 2 ft. 2 in. diameter, provided with ornamental top and bottom mouldings. Only five of the condensers are new; the other three having been moved from the old works and refixed, so as to complete the set. Ample provision is made for cleaning; and the connections are arranged so that all the condensers may be in operation at once, or either row be bye-passed.

About the exhausting plant, all that need be said is that at present there is in position one new three-blade rotary exhauster, capable of passing 25,000 cubic feet of gas per hour. It is belt-driven from a countershaft by a horizontal high-pressure steam-engine, and is provided with steam and gas governors. A second exhauster and engine of similar pattern have been brought from the old works, and fixed in the same building.

FIG. 8.—PURIFIER HOUSE, SCRUBBER, AND BACK OF SULPHATE-HOUSE.

Passing on, it is seen that for ammonia extraction a tower scrubber, 7 feet diameter by 40 feet high, filled with boards, has been erected. On the top of the scrubber, there is an automatic clean-water distributor, and about half-way up a fixed liquor distributor. Provision is made for the addition of a second scrubber; and the connections have also been arranged so that the existing washer-scrubber at the old works can be removed and refixed as soon as the works are dismantled.

THE PURIFIER-HOUSE.

In the completeness of the purifier-house is found considerable interest. As seen in one of the photographs, the house is arranged with the purifiers overhead, and the revivifying-floor underneath. One side of the building on the upper floor is left open for ventilating purposes. The purifiers are four in number, each 25 ft. long by 15 ft. wide by 5 ft. 6 in. deep inside, formed in one large box, and subdivided with division-plates. The boxes are on Green's system; the joints between the covers and the boxes being made with an india-rubber frame bolted to the cover. Each purifier is provided with four tiers of grids, and will be charged with oxide. The arrangement is such that any number of purifiers may be worked "on" or "off" in rotation, by a Weck eight-way centre-valve.

For filling the purifiers, a removable light railway is laid on the revivifying-floor underneath. Running on these rails, are two light waggons, on which are placed steel tipping skips. After being filled, the waggons are run out at one end of the building, where the skips are raised to the upper floor. They then traverse the underside of the roof, and are tipped into any portion of a purifier with the greatest ease. The elevator and conveyor

FIG. 9.—INTERIOR OF THE METER AND GOVERNOR HOUSE.

is a very simple and most effective arrangement, driven from a small vertical engine fixed in one corner of the house; and the whole of the lifting, lowering, travelling, starting, and stopping is done by one man by means of two levers. With this arrangement, the boxes can be filled very cheaply and quickly; while for emptying the boxes, the oxide is shovelled through shoots fixed in the bottom plates. The gas enters the purifiers between the second and third tiers of grids; one-half of the gas passing upwards, and the other half downwards through the oxide. It finds its exit through a lute, which is open both top and bottom. It is pointed out that this arrangement combines the system of slow purification, and only requires the ordinary type of grids.

Other Parts of the Plant.

A new cylindrical station meter made by the Gas-Meter Company, with a capacity of 20,000 cubic feet per hour, has been provided; and in the same building is noticed one large 12-inch governor for the Ilfracombe district, and one new 8-inch governor for the Combemartin district.

The storage holder on the works was erected in 1896, and is a two-lift one of 100 ft. diameter by 24 ft. deep, fixed in a concrete tank, with twelve strong lattice steel standards braced together diagonally with tie-rods and two rows of girders.

The whole of the works' connections are 12 inches diameter, and have been arranged so that they all drain automatically without any pumping of the syphons being necessary at any part of the works.

Attention is next directed to the tar storage tank, 20 ft. diameter by 12 ft. deep, and the liquor storage tank, 25 ft. diameter by 12 ft. deep, both of which are of steel, buried in the ground, and provided with curved steel crowns, which rise about 1 foot from the ground.

For providing steam for the works, two Cornish boilers, 18 ft. long by 5 ft. 6 in. diameter, have been provided. They are fitted with Meldrum's forced-draught grates, and will blow-off at 80 lbs. pressure.

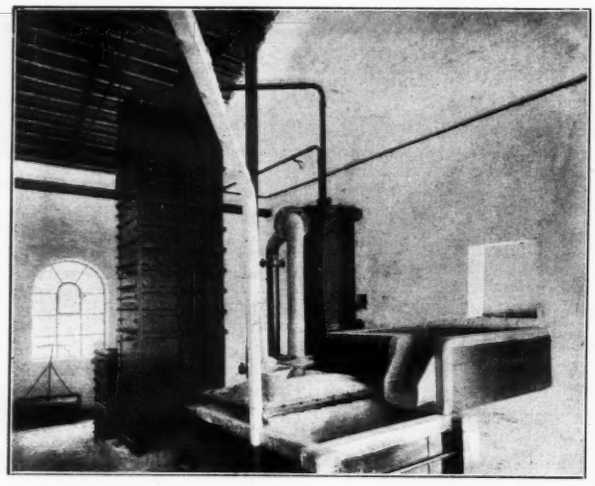


Fig. 10.—Interior of the Sulphate House.

The sulphate plant is a neat arrangement. It is of Dempster's improved continuous type, and capable of yielding 20 to 25 cwt. of salt per day. The primary and secondary stills are rectangular, and every provision is made for cleaning. The saturator is of the wooden-case type, lined with lead, and prepared for hand-fishing. It being very desirable that no nuisance should be caused by the effluent and waste gases from this plant, an extra large purifier and lime-settling tanks have been put down.

The Blue Water-Gas Plant.

In view of recent discussion, the blue water-gas plant and the method of utilizing its product, will have both present and future interest. The plant has a capacity of 125,000 cubic feet per twenty-four hours, and is, as previously stated, on the Dellwik-Fleischer system. Coke is conveyed from the retort-house across the yard, and is delivered into a hydraulic hoist, where it is raised to the charging-floor. This plant, in continuous working, will make 60,000 cubic feet of blue water gas per ton of coke charged into the generator; and it is intended to use the plant regularly, and mix the gas with the coal gas. The water gas is delivered into a small storage holder, 25 ft. diameter by 10 ft. deep, in a steel tank; and from the holder it is measured through a rotary meter, and passed to the retort-house. By means of a special arrangement of superheating with radiated heat from the brickwork of the retort-bench, the water gas is heated and mixed with the coal gas in the foul main. The present intention is to use from 15 to 20 per cent. of water gas.

Water Supply.

The water supply for the works is pumped from the stream on the low side of the site to a large cast-iron tank, containing about one day's supply, fixed near the top of the hill. This tank being situated considerably above any portion of the plant, there will always be a good pressure throughout the works, as well as at the top of the scrubber.

We will conclude this description of the works by stating that the whole of the yards and roadways have been laid with good stone beds, and covered with macadam. There is, of course, also a proper system of drainage throughout the works. It is intended during the present year to build new offices and Directors' rooms, and to fix a weighbridge close to the entrance to the works. Later, a boundary wall will be erected along the low side of the works, continuing it alongside the stream, and connecting with the high retaining-wall which is already built round the large gasholder.

PERSONAL.

We learn that at a meeting last Tuesday of members of the Town Council of Glasgow who are favourable to the candidature of Preceptor R. M. Mitchell for the Lord Provostship of the city, it was found that a majority of the Council were prepared to support him, even making allowance for any possible changes at the November elections. Mr. Mitchell has been a member of the Council since 1884, and has for about ten years been the Convener of the Gas Committee.

Mr. J. W. Buckley has been presented by the employees of the Falmouth Gas-Works with an illuminated address as a token of the esteem and regard which he inspired during his association with the undertaking. Mr. W. Corfield, the Secretary, made the presentation, and heartily congratulated Mr. Buckley on his appointment to the more important position of Gas Engineer and Manager to the Corporation of Devonport. Mr. Buckley acknowledged the gift and introduced his successor, Mr. Hoare, who, he said, came with excellent testimonials from Taunton, and for whom he wished as pleasant a time as he himself had had at Falmouth.

On Saturday week, at the invitation of the Engineer and Secretary (Mr. J. T. Jolliffe), the staff of the Ipswich Gas Company visited Bawdsey Manor and grounds (by the kind permission of Sir Cuthbert Quilter, M.P.), and afterwards partook of tea at Felixstowe. Advantage was taken of the occasion to present to Mr. Wilfrid E. Jolliffe, a solid leather fitted suit case, as a memento of the completion of his term of pupilage at the gas-works, and as a token of good wishes on his removal for further experience to the Bournemouth Gas-Works. The presentation was made by Mr. F. Prentice, the Manager, on behalf of the staff; and Mr. Jolliffe suitably acknowledged the gift.

A pleasing ceremony took place at the Ilford Gas-Works last Friday week, when Mr. A. A. Johnston, the Engineer and Manager, presented Mr. J. C. Bell, of the Engineer's staff, with a handsome marble timepiece and statuettes to match, together with a silver plated cruet, subscribed for by the Company's staff and workmen, to celebrate the occasion of his marriage. Mr. Johnston, in a few appropriate remarks, said that he thought marriage was contagious, but was pleased to know that members of his staff were sufficiently comfortable and satisfied with their positions to undertake the responsibilities of married life. He wished the happy pair a long and pleasant life. In a short reply of thanks, Mr. Bell said he was grateful to Mr. Johnston for his kind remarks, and also for the good wishes of the staff and men. He hoped to be able to keep the handsome presents for many years, as an interesting souvenir and reminder of the good feelings shown towards himself and his wife. The proceedings terminated with three cheers for the bride.

Among the appointments by His Majesty the King on the occasion of the celebration of his birthday, we notice that Lord Rayleigh, F.R.S., has been made a member of the Privy Council; that Dr. A. B. W. Kennedy, F.R.S., Mr. Boverton Redwood, and Colonel S. A. Sadler, M.P., have received the honour of knighthood; and that Mr. J. Henry Birchenough has been appointed a Companion of the Most Distinguished Order of St. Michael and St. George. Lord Rayleigh, as our readers are aware, is the Chief Gas Examiner for the Metropolis; Dr. Kennedy and Mr. Boverton Redwood are authorities on electrical and other engineering and petroleum; Colonel Sadler is well known in the gas industry from his connection with the firm of chemical manufacturers at Middlesbrough (of which he was twice Mayor), and from his occupancy of the presidential chair of the North of England Gas Managers' Association in 1894; and Mr. Henry Birchenough is a Director of the Imperial Continental Gas Association, and of the Continental Union and Danish Gas Companies. Some of our readers may remember that at the meeting of the Association in May, 1903, the Chairman (Mr. J. Horsley Palmer), when moving the re-election of Mr. Birchenough as a Director, explained that he was absent owing to his having been deputed by the Government to proceed to South Africa to report on the commerce available there to British enterprise.

PRESENTATION TO MR. WALTER T. DUNN.

In another part of the "Journal," reference is made to the proceedings at the "Coming of Age" summer meeting in London last week of the Junior Institution of Engineers. An especially happy incident marked one of the functions—that of the reception on Tuesday evening at the Royal United Service Institution in Whitehall; and in that incident our readers who are members of the Institution of Gas Engineers will be interested. Mr. Walter T. Dunn is not only Secretary of the Institution with which gas engineers are intimately identified, but he is Secretary of the Junior Institution of Engineers. He has occupied this post continuously for a period only a few months short of its existence; and to him perhaps more than any man is due the astonishing success of the Junior Institution—its membership now numbering close upon 900. Very generous, though not beyond the merit, were the encomiums passed last week upon the Secretary and his work for the organization—more especially by those whose recollections of that work extend back unbroken over the number of years' existence the members of the Institution were celebrating last week. The incident came just before the delivery of one of the lecturettes on the programme of entertainment on Tuesday night. For this the lecture hall (well known to gas men) was thronged with an expectant audience who knew more about what was coming than Mr. Dunn himself. His colleague of the Institution of Gas Engineers—the Hon. Secretary, Mr. J. W. Helps—was witness of this the greatest evidence of regard that could have been paid to any man in like position.

The President (Mr. W. H. Lindley, M.Inst.C.E., F.G.S.) introduced the matter, by naming gentlemen who desired to speak; and then in turn the Chairman (Mr. Samuel Cutler, jun.), Mr. Percival Marshall, Mr. W. J. Tennant, and others, gave expression to richly deserved panegyric of Mr. Dunn as a man, a friend, and a worker. Then the President presented to Mr. Dunn, in the name of upwards of 430 subscribers, a massive solid silver bowl on an ebonite stand. On one side was the inscription:—

Presented to
Walter T. Dunn
by Members in Token of their High Appreciation of his
Invaluable and Untiring Services as Secretary since December, 1884.

On the opposite side was the monogram J. I. E., and 1884-1905. Accompanying the bowl was an album, containing the signatures, on separate cards, of all the contributors. The first page also contained the above inscription; and on the cover were the raised initials of the titles that the Society has borne during its existence. "V. S. 1884" (Vulcan Society). "L. J. S. S. 1884-5" (Lambeth Junior Scientific Society). "J. E. and S. S. 1885-1886" (Junior Engineering and Scientific Society). "J. E. S. 1886-1894." "I. J. E. 1894-1902." And in the centre of the cover "J. I. E. 1902-1905." In addition, there was for Mrs. Dunn a crocodile purse, silver mounted, with the initials, "M. D." on the front, and containing a cheque.

Mr. Dunn's thanks were rendered in few but sincere words. The surprise, the richness of the gift, the great friendship which it all carried home to him, naturally stirred up within him some emotion. The act, the words, and the loud applause which greeted him certainly mark a spot in his career never likely to be forgotten by him.

THE RECORDS OF WORKS' COSTS.

By a Gas Administrator.

As an administrator, I have read with considerable interest the recent articles appearing in the "Journal" relative to Mr. Herring's paper on the "Manufacturing Costs at the Granton Gas-Works."

Reading between the lines of your leading article in the issue of the 20th ult., one gathers that there are indications of some reluctance on the part of the Council of the Institution to give opportunities for dealing with the very important commercial question raised by Mr. Herring. Not only is the reluctance present now, but has apparently been present for some considerable time past; for I find that this same question was dealt with by the same author two or three years ago.

The legal mind when endeavouring to elucidate an apparent enigma, first seeks for motive. Applying this process of reasoning to the facts on record, one can only conclude that Mr. Herring's suggestions are of such a revolutionary character, or perhaps of such a character as to seriously stir up the traditions of the past, that the majority of his *confrères* are reluctant to see his wishes carried out for fear of exposing the weak spots in their own concerns. This may be all very well from a gas manager's point of view; but the gas undertakings of the country do not exist for the benefit of gas managers, but primarily for the benefit of the gas consumers, whose interests are, of course, common with those of the gas shareholders.

Mr. Herring appears to occupy an impregnable position, as a result of the unique circumstances associated with his life's work. He has had the opportunity of putting his own house in order before casting stones at those of his neighbours; and, in doing this, he has to a great extent departed from the well-trodden track and the ruts of the past, and has perhaps, in consequence, ruffled the feelings of many, who, whatever else their failings, are conscious of their own inability to break with the traditions of the past.

Success invariably begets a certain amount of envy from many of one's fellows; and it is not an unknown thing that this is accentuated when it originates in the person of a young and independent spirit, who has had the courage of his own convictions and whose thoughts have been put into works, and the works on trial not found wanting. Apparently, Mr. Herring has achieved a record, and a record to which every gas administrator, whether he be associated with private companies or public bodies, should give the closest study.

Your explanatory articles enabled me to appreciate what has been done, and to distinguish as between particular plant and the particular general arrangement of a works using such plant. Your references also to the possibility of scrapping existing works or plant, and introducing modern in its place, without adding to the burden of the gas consumer, is a striking instance of what enlightened finance with practical skill can do. It appears to me that the affairs of every important gas undertaking in the country should be investigated and analyzed from the advanced standpoint now before us. If our managers are reluctant to keep their records so as to enable such analysis to be made, it is a question whether the Boards of Directors and Committees should not instruct their auditors or their accountants to keep the books in such a way that all of the important points dealt with may be elucidated in every works.

The gas industry is a national industry and a necessity of civilized life, and must not be treated from a parochial point of view; and it is high time that the general administration of gas undertakings was put on a higher and more scientific plane, so far as their commercial administration is concerned.

Technically, no doubt, our engineers have done a great deal; but it is apparently admitted that the engineers themselves are at a loss to appraise the real worth of many devices used in different parts of the country. They seem to be unable altogether to classify them on the true basis, such as the commercial man alone looks at. A machine of any class may be highly successful from the engineer's or mechanic's point of view; but from a commercial point of view, it may be an utter failure, and if I gather rightly, Mr. Herring's crusade against the old traditions is to permit of this scientific commercial appraisement of the relative value of what is at present at hand.

If the present-day manager fails to appreciate the importance of this issue, then it is the duty of others to determine that such appraisement shall be ascertained by others than he, and his work checked in the same way as is done in all large commercial industries throughout the country.

POSITION OF PHOTOMETRIC MEASUREMENTS.

By Jacques Abady.

I read with interest the editorial remarks which appeared in your last issue, on the subject of a paper by Mr. A. C. Jolley, on the position of photometric measurements. Being a member of the Optical Convention, I had looked forward to being able to be present when the paper was presented, and accordingly have some notes of intended comments by me. Unfortunately, circumstances prevented my attending; and I am glad of this opportunity to make one or two remarks.

Curiously enough, the criticism which you make almost entirely covers the notes I had on one portion of Mr. Jolley's paper—namely, standards of light—and I can only emphasize what you very rightly say.

Travelling beyond this, the first point that calls for attention is what Mr. Jolley has to say upon the Lummer-Brodhun screen. Now, I hold most strongly to the opinion—based on a long and impartial investigation—that there is absolutely no advantage in the use of the Lummer-Brodhun screen. I am aware that great authorities claim that it is a useful and accurate piece of apparatus; but, against that general statement, I set: Firstly, the defects which are inherent to, and cannot be separated from, the use of optical trains. Secondly, the remarks of Professor Stine, that it "will yield probably no better results than the Bunsen screen under similar conditions," and that "it causes the eye to fatigue rapidly, and is confusing in forming a judgment of contrasts." "The mirrors, too, are a fruitful source of derangement; for unless they are identical in reflecting power, neither an equally illuminated field nor equal contrasts can be obtained." "The contrast-principle demands, on the part of the observer, both practice and skill, especially with different coloured lights." And so on. Thirdly, against this I set the statements that can be found in any scientific treatise on photometry, as to the comparative accuracy of the Bunsen screen to the Lummer-Brodhun; and I say again that a properly constructed Bunsen disc-box, with a good screen in it, is far superior for lights of equal colours to the Lummer-Brodhun screen, and that neither of them is any use at all for lights of different colour.

Before I leave the question of the Lummer-Brodhun screen

may I draw your readers' attention to Mr. Jolley's ingenuous remark that there is a curious defect in all examples of the Lummer-Brodhun screen which he has had an opportunity of examining. This defect is that the photometer does not reverse correctly. Mr. Jolley seems to find some difficulty in coming to an explanation as to how this is; and I do not propose to insult the intelligence of "JOURNAL" readers (than whom, collectively, there is no body of men with greater practical knowledge of photometry) by pointing out what the perfectly obvious reason is.

It is a refreshing contrast to see that Mr. Jolley's investigations have led him to give a much fairer criticism on the Trotter photometer.

The next point is the question of "Flicker" photometers. Mr. Jolley's paper is a historical *résumé* on photometrical work, and therefore the facts should be accurately stated, and I challenge the view he presents to your readers of the inception and general introduction of "Flicker" photometers. The Newtonian disc is the parent. Whitman and Rood are those who first of all did any work on the subject of which I have seen any record; and until Mr. Simmance and I, working some three years ago, took the matter up and investigated the real underlying principle, no "Flicker" photometers were known on the Continent of Europe nor in England, while none were in practical use in America.

As a matter of fact, the work of Whitman—while being exceedingly interesting—was of no practical value at all, because what he designed was not a true "Flicker" photometer. In fact, it was not a photometer at all. Fleming's Maltese cross is in the same category. Rood was nearer the mark, but he was incorrect; and what Bechstein has done is practically the same as Rood has done. The Kruss form—at least, the one Kruss form which Mr. Jolley mentions—I leave severely alone. It needs no comment.

The point I want to make clear, for the sake of historical accuracy, is that the people who have been concerned in the inception of "Flicker" photometers are Whitman, Rood, and ourselves; and the invention has not been put in a practical form by the filtering down through the medium of the work of German professors, which is the view one would naturally get from reading Mr. Jolley's remarks.

Mr. Jolley's comments on the accuracy of the "Flicker" photometer require just one or two words. I have read "Lauriol's Investigation" in the original; but it was impossible to follow what Professor Lauriol was trying to prove. He probably had some basic idea which is not connected with the proof of the accuracy or otherwise of the photometer; but what the idea was, does not appear from a perusal of the communication Professor Lauriol made.

With regard to Mr. Jolley's own experiments, and his remarks on what we have had to say about the Purkinje (not Purkinge) phenomenon, I thought the arguments we put forward have been remarkably clear and unequivocal. All I ever claimed is that the Simmance-Abady "Flicker" photometer enables one to make accurate comparisons of intensity between two lights of dissimilar colours, or whatever it is that one compares when using a Bunsen disc with lights of the same colour.

Colour sense, certainly, does not enter into the matter, because a person blind to green gets the same result as a person blind to red; while as to the comparative accuracy, one can read on the "Flicker" photometer (and read without any doubt) a light of one-thousandth of a candle power, a light of two-thousandth of a candle power, and up to a thousand and two thousand candle power, until one gets to lights of the highest power known. And, moreover, one can get these very sensitive and close readings however dissimilar the colours of the two lights.

The Purkinje phenomenon itself is not a question of colour sense, but a question of relative colour sense; and the reply to any criticisms of our statement with regard to the independence of the Simmance-Abady photometer to this phenomenon is this: Make an experiment and see how the ratio between a blue and red at 3 metres distance compares with the ratio of a blue and red at 1 metre distance. The results are, of course, the same.

You cannot expect to be able to put a sensitive instrument of this kind on a photometer, come out of the daylight, and then read a light whose candle power is one-thousandth of a candle. But if light is rigorously excluded from the room, and the eyes rested before commencing the test, one can read one-thousandth of a candle with as great ease as one thousand candles. I claim that this cannot be done on any other photometer, even when the lights are of the same colour; and I wish to make it clear that I am not talking about dividing the square of one distance into the square of another distance, and bringing it down to the third decimal place. I am talking about the actual initial power of the light being tested—something more than the glow of a match-head.

There are many other points upon which comments could be made; but I have already trespassed to such length on your space that I hardly like to add anything to the above.

The criticism I make on Mr. Jolley's paper is unambiguous and severe, and intentionally so, for I am addressing gas men, who know more about the practical side of photometry than any professors and theorists, and who have enough cause to regret that so often the vital interests of their undertakings are dependent on tests made by men who, brilliant in their scientific attainments as they may be, approach photometry from the bare theoretical point of view, and are without the slightest practical experience as to what commercial photometry means.

JUNIOR INSTITUTION OF ENGINEERS.

"COMING OF AGE" is an event that calls for celebration and rejoicing. Last week the Junior Institution of Engineers attained their "majority"—that is to say, it is exactly 21 years ago last Friday that the Institution, in a very unpretentious form, but with high aims and intention, was born; and it has grown and flourished with great strength. This year is, therefore, a special one; and so the summer meeting was held in London, a week was devoted to it, and the whole was spent in rejoicing and sight-seeing, with a strong leaning, of course, to engineering.

One feature of the week was the kindly countenance given to the Institution by men distinguished in science, engineering, and civic life. A good "send-off" was accorded on Monday by the Lord Mayor of London (Alderman Sir John Pound) and Sheriffs Strong and G. J. Woodman. A large number of members, together with many of their ladies, assembled in the historic Council Chamber of the Guildhall; and promptly at half-past eleven, preceded by the mace-bearer, the Lord Mayor and the Sheriffs, in their official robes and emblems of office, accompanied by the President of the Institution (Mr. W. H. Lindley, M.Inst.C.E., F.G.S., of Frankfort), the Chairman (Mr. Samuel Cutler, jun.), and the Vice-Chairman (Mr. Adam Hunter), entered the chamber. The Lord Mayor at once took the chair; and to the right and left of him were ranged the gentlemen already named, and several delegates, bearing names eminent in the engineering world, from the great senior organizations. In his own name, that of the Sheriffs, and of the Corporation, the Lord Mayor gave the Institution a hearty welcome, and expressed the hope that their present and future deliberations would be as satisfactory to themselves as they could possibly desire. His gift of expression clothed in most eloquent language the acknowledgment which the President made of the honour the Lord Mayor had done the Institution in receiving the members, and in gracing their meeting with his presence. Alluding to Municipal Government, Mr. Lindley remarked upon what he had seen lately in travelling through Russia; and here we have an example of his beautifully rounded periods: "My Lord Mayor," he said, "being brought into close proximity with these facts, naturally impresses one with the importance of liberty in the development of institutions and of concord in the carrying out of the same. And it is a delight to see a Corporation entrusted with the management of the affairs of this enormous city acting in concord, suppressing small points of difference, attending to the main chance, and following out the great lines of improvement for the benefit of the whole." It was left to Sheriff Strong to reply; and he assured his hearers that the Corporation would be false to their ancient traditions if they were not prepared at all times to welcome their fellow-countrymen and distinguished foreigners. The Corporation, of course, recognized, in common with the public, the vastly important office which engineers wield for the common good of the country, and for the knitting together of international interests, which were inseparably associated with the promotion of their own professional objects.

When the Lord Mayor and Sheriffs had left the chamber, there was a formal welcoming of the representatives of the senior organizations—the President remarking upon the pleasure it gave him in seeing them, more especially as they had kindly come to present their congratulations on the "Coming of Age" of the Institution. Response was made by Dr. (now Sir) A. B. W. Kennedy; and his rising was the signal for much applause—he having been the first President of the Institution some 20 years ago, when it was, of course, comparatively small in numbers. He congratulated the Institution upon the manner in which it had succeeded and progressed. The great success showed him that it must have filled a want. It had been useful to its members; and it was obvious that, by its staff, and particularly by its Secretary (Mr. W. T. Dunn), it had been thoroughly well managed. He could do nothing better than, on behalf of the various Societies represented there, to wish the Institution a future as successful as the past had been. For his exceedingly kind words, Dr. Kennedy was thanked by the President. In further remarks, Mr. Lindley said the members were now looking back upon 21 years of life. At that time—in 1884—many of the present members were no doubt very junior; and those who were connected with the Institution in its early days must now be getting well on into seniority. In order to give special expression to the attaining of their majority, the Institution were seeking a Charter of Incorporation; and he hoped that their 21st year would actually see the Institution incorporated. In concluding his observations, he said he could do nothing better than wish the Institution "eternal youth," in the sense that it would always recruit itself from the young and fresh spirits enthusiastically looking into the future, seeking the truth, and trying to do their best to better the welfare of mankind. He hoped the Junior Institution would ever be the Junior Institution in that sense. They could look back on years of useful work; and they looked forward to further years of such work and great progress.

Following this a telegram was dispatched to Lord Kelvin, the revered Vice-President, expressing the sincere birthday congratulations of the assembled members. Mr. W. J. Tennant, who is a Past-Chairman, then read some notes on the "Origin and Progress of the Junior Institution of Engineers—taking the members back to the early part of 1884, and to the Westminster Bridge Road works of the world-famed, but now defunct, firm of Maudsley

Sons, and Field, to tell of the foundation, at the instigation of Mr. S. H. Wells, Assoc.M.Inst.C.E., Wh.Sc., and now principal of the Battersea Polytechnic, of the Vulcan Society, which continues its life to-day as the Junior Institution of Engineers. Six months later, Mr. Wells became Chairman of the Society, and Mr. Walter T. Dunn began a career (as Secretary) of ardent usefulness in connection with the Institution and its precursor. "This connection," said Mr. Tennant, "has been maintained for nearly 21 years, to our great advantage. The appointment was at first purely honorary; and it remained so for more than five-and-a-half years. During the last part of this period, and thereafter, the duties increased to such an extent that in 1893 it became necessary for Mr. Dunn to make a choice between the retention of a salaried and secure position he then occupied in the Institution of Mechanical Engineers and a precarious and less remunerative post that the Juniors at length found themselves just prosperous enough to afford him. To his lasting credit, be it said, he relinquished the greater for the less, and displayed (and not for the first or the last time) that spirit of keen regard for the Institution by which his work for it has been uniformly characterized." In 1886, Professor A. B. W. Kennedy became the President, and for four sessions he held the post; his interest and influence being of material assistance in the development of the Institution. The line of eminent gentlemen who have followed Professor Kennedy in the Presidentship is now a long one. On June 17 last, the membership stood as follows: Honorary officers, 35; honorary members, 42; members, 775; and associates, 22—total, 874. The notes were of a voluminous character; but the story of progress finds a fitting ending in that total membership. There is ample evidence that the Institution intends to go on making history as it has done in the past.

There were hearty thanks to Mr. Tennant for his comprehensive contribution, which was prepared in style that was most entertaining. In a very appropriate speech, the Chairman (Mr. Samuel Cutler, jun.) proposed a vote of thanks to the Lord Mayor and the Corporation for the use of the Council Chamber; and after being seconded by the Vice-Chairman (Mr. Adam Hunter), it was enthusiastically carried.

A little later, luncheon was served at the Tiffin Restaurant. In the afternoon, St. Paul's Cathedral was visited under the guidance of Archdeacon Sinclair and the Consulting Architect (Mr. Somers Clarke). During the visit, there was a choral service, with anthem "Great and Wonderful;" and the Archdeacon delivered a special address. Subsequently, the Lord and Lady Mayoress received and entertained the members and their lady friends to tea at the Mansion House.

On Tuesday, a visit was paid to Woolwich Arsenal; and in the evening there was a conversazione at the Royal United Service Institution, Whitehall. The reception of the visitors occupied the President, the Chairman, and Mrs. Cutler a whole hour; but time had no effect on the graceful word and warm welcome extended to each guest—particularly by Mrs. Cutler. The guests numbered nearly 300, and included Lord Armstrong, Sir William and Lady White, Sir John Wolfe-Barry, Professor Unwin, and Mr. J. W. Helps. During the evening there was a presentation to Mr. Dunn, which is specially noticed elsewhere. A programme of music was performed by the band of the Empress of India Lancers, and vocal music was rendered. The Nelson Centenary Exhibition was also open to the visitors; and there were a couple of entertaining electric lantern lecturettes.

The remainder of the week was occupied by visits to railway works, tramway generating stations, the Mint, Messrs. Yarrow's works, Chatham Dockyard (by river), the Doulton Potteries, and the Earl's Court Exhibition. Friday was Foundation Day; and it concluded, as did the eventful week, with a dinner in the evening in the Queen's Restaurant at the Exhibition. The week will furnish the material for one of the most pleasant chapters that can be, or will hereafter be, found in the records of the Institution.

A short time ago a lock-out occurred in Dublin as the result of a dispute between the Master Builders' Association and the Dublin Brick and Stone Layers' Union on the question of whether the masters were or were not to enjoy the advantage accorded to builders who are not members of the Association of having work done for them by measurement or agreement. The masters had to pay the bricklayers at the standard rate per week, irrespective of the amount of work done; and the result was that their expenditure in the shape of wages was larger than that of builders who were not connected with the above-named body. The matter was referred to Alderman W. F. Cotton, J.P., the Deputy-Chairman of the Alliance and Dublin Consumers' Gas Company, as sole Arbitrator; and he has just made his award. It is to the effect that the Dublin masters are to be at liberty to employ tradesmen from any recognized Society of Bricklayers in the United Kingdom; but if the men continue to work in Dublin, they are to be bound, within twelve months from the date on which they begin work, to join the Society. The award settles on a definite basis matters which have been in dispute for some years; and it is expected that a lengthened period of peace, and it may be hoped prosperity, in one of the most important trades in the city, will be the result.

EXCURSION MEETING OF THE SOUTHERN DISTRICT ASSOCIATION.

A Visit to Dorking.

What would otherwise have undoubtedly proved one of the most successful summer outings of late years of the Southern District Association of Gas Engineers and Managers was to a considerable degree spoiled by the unfavourable weather conditions prevailing last Thursday. Every care had been taken by the President of the Association (Mr. Samuel Carpenter) and the Hon. Secretary (Mr. James W. Helps) to provide a day of mingled interest and enjoyment for the members and their friends; and probably in no part of England (certainly not anywhere within such a reasonable distance of London) could a place have been selected for a day of real enjoyment in the country than the home of the President for the year—Dorking. But the possibility of thoroughly realizing how beautiful this part of Surrey really is, was denied to those of the party who were visiting the locality for the first time. Several heavy showers made a long drive in open conveyances anything but an experience to be wished for; and when rain was not falling, the murky condition of the atmosphere was very depressing. The members, however, loyally supported the President in getting through the programme as well as possible; and they did all they could to mitigate what must—after his trouble in arranging the day—have been a bitter disappointment to Mr. Carpenter.

The arrivals of members from various parts was timed for about noon; and conveyances took the party first of all to the gas-works, where they were welcomed by Mr. Carpenter and several of his Directors. An hour and more was spent inspecting the works, of which two views appear on p. 30.

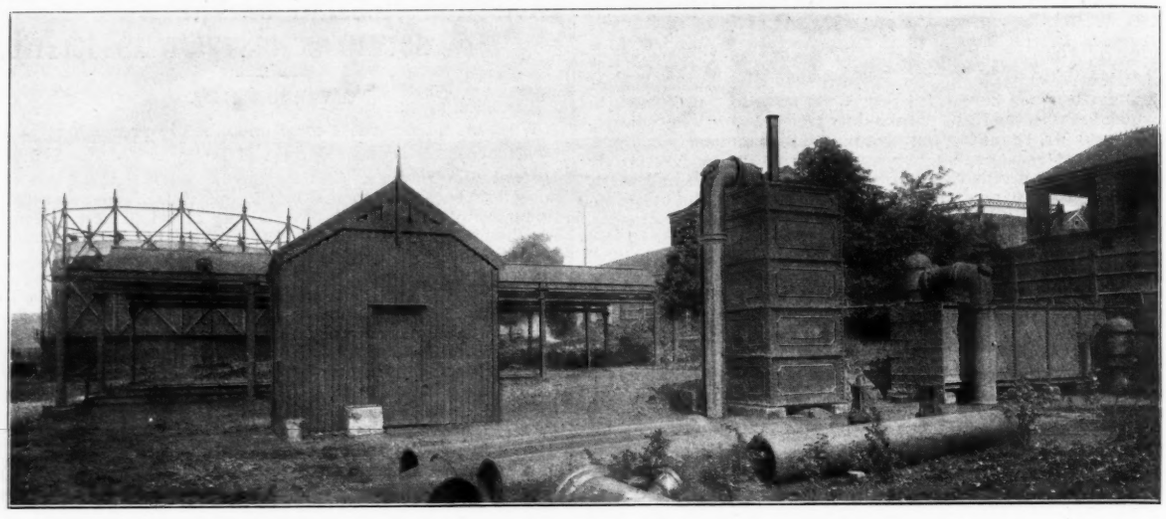
The President, in a leaflet handed to the visitors, pointed out that the Dorking Gas Company was formed in 1834; was incorporated in 1871; and obtained additional powers in 1901. The towns and villages in the area of supply are: Dorking, Holmwood, Westcott, Wotton, Abinger, Ockley, Capel, Newdigate, and a part of Fetcham, Great Bookham, Little Bookham, and Effingham. The length of mains at present laid is 25½ miles. The works have recently been enlarged and brought up to date; but exhausting plant, a station meter, and the balance of the retort-settings have still to be erected. The capacity of the works is 100 million cubic feet per annum. The retort-house is of the stage-floor type, arranged for eight settings on the regenerative system of eight retorts each, 22 inches by 16 inches by 10 feet long. Four settings of the Hislop type have been erected; the production per setting ranging between 68,000 and 72,000 cubic feet per diem, or (say) 8500 cubic feet per mouthpiece when carbonizing Durham coal. The make of gas per ton is 11,200 cubic feet of 15-candle power. The coke "wheeled out for sale" is 10½ cwt. per ton of coal carbonized.

In the absence of a siding, the coal is carted from the railway and shot into a grid—some 80 per cent. passing through to the boot of the elevator, and the balance being broken by hand. The elevator is a single chain one; and the conveyor is of the belt type, with Graham's idler rollers. The installation is capable of raising 10 tons of coal per hour to a height of 30 feet; and, by means of the conveyor, it is deposited at any point in front of the retorts. Sufficient space is arranged for fourteen days' stock for each setting. The motive power consists of a 13 brake horse power Crossley gas-engine. The cost of elevating and stacking the coal, including wear and tear charges, is 3d. per ton.

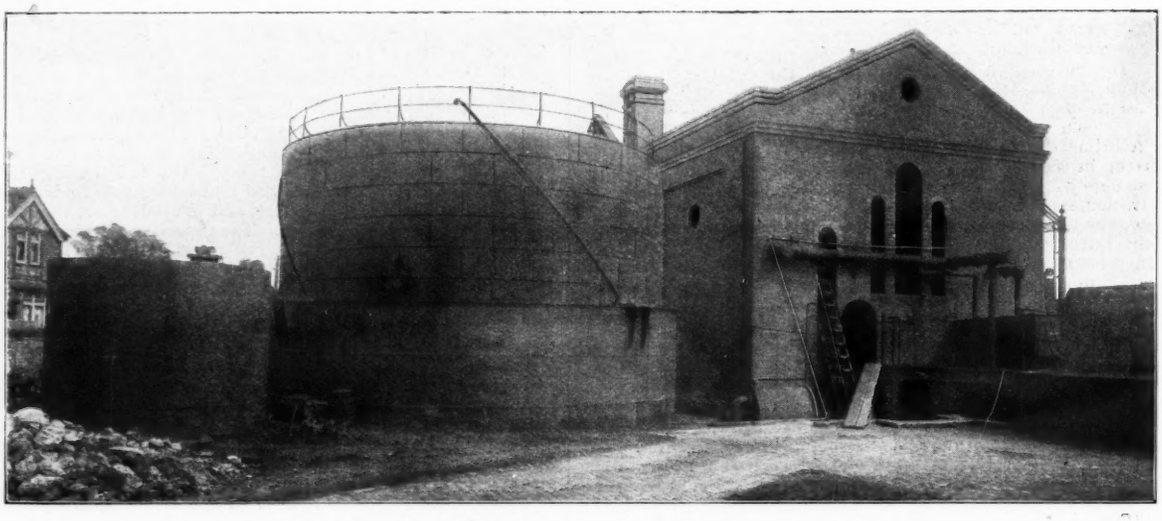
There are two exhausters of 10,000 cubic feet per hour capacity of the Beale direct type. They are steam driven. The condenser is of the horizontal and water-cooled type. The washer and scrubbing plant employed is of the vertical chamber type. Light tars, sulphuretted hydrogen, and carbonic acid are removed in Nos. 1 and 2 chambers by ammoniacal liquor; Nos. 3, 4, and 5 chambers are for the removal of ammonia by water. The purifiers are four in number, of the luteless type, fitted with Milbourne's rapid fasteners. The sulphate plant has a capacity of one ton per diem, and consists of a Walker's still and Taylor's saturator. The water supply and tar and liquor pumps are of 4000 gallons per hour capacity, driven by a 7 brake horse power gas-engine.

The other details enumerated were that the holders are three in number; 420,000 cubic feet capacity. The water-gas plant is of Humphreys and Glasgow's type, of 150,000 cubic feet per diem capacity. There are three boilers—two of 25-horse power, and one, for the sulphate plant, of 10-horse power. There are two steam blowing engines of 20 indicated horse power. The boiler feed, oil pumps, &c., are of the Worthington steam type. The relief holder (Gadd and Mason patent) has a capacity of 20,000 cubic feet. The three governors are of Cowan's, Parkinson's, and the Gas-Meter Company's makes. The laboratory is fitted up with a Letheby photometer, a Simmance and Abady calorimeter, &c. Finally, the number of consumers at present is 1395; the number of stoves on hire, 1130.

Much interest was evinced in the works, and Mr. Carpenter was plied with a thousand-and-one questions as to what he was doing and why—many of the queries being evidently the outcome of a study by the members of the President's Address since it was delivered at the annual meeting in February.



General View of the New Portion of the Dorking Gas-Works.



The Retort-House, the Relief Holder for the Carburetting Water Gas Plant, and the Oil Tank.

On leaving the works, a short walk brought the party to the Public Hall, where the Directors of the Dorking Gas Company had provided what was in all respects a most sumptuous lunch. The President occupied the chair; and among the Directors of the Dorking Gas Company present were: Mr. Herbert Young (Chairman), Mr. W. T. Butler, and Major Harman Young. Also Mr. W. S. Carpenter, the Assistant Manager at the works, and Mr. G. S. Mathews, the Town Surveyor. After the usual loyal toasts, the toast of the "Town and Trade of Dorking" was given by Mr. F. W. Cross (Lea Bridge), the Vice-President of the Association; and it was responded to by Mr. R. L. Moore, an Auditor of the Company. Mr. J. W. Helps (Croydon) proposed prosperity to the Dorking Gas Company, and coupled with it the name of the Chairman, Mr. Herbert Young. The toast of "Success to the Southern Association" was proposed by Mr. T. Berridge, the President of the Midland Association; and in the course of his remarks, he expressed the pleasure all felt in seeing among them that day their esteemed friend, Sir George Livesey. The President briefly replied; and this ended the proceedings of the morning.

During the lunch, the weather showed signs of some improvement, and this tempted more of the members than would otherwise have been the case to risk the afternoon drive. Unfortunately, soon after the start rain began again to fall; and the time till the Burford Bridge Hotel was reached for tea was spent amid anything but pleasant surroundings—the damp mist hiding much of the lovely hillsides for which the neighbourhood of Dorking is so justly celebrated.

The only "business" transacted—at the luncheon table—was of a formal character, being the election of three new members: Mr. W. R. Davey, of Newbury; Mr. W. P. Hotchkin, of Coggeshall; and Mr. Er. W. Smith, of Chelmsford.

Use of Coke Dust in Generator Firing.

In another part of the "Journal," an abstract is given of the paper read by M. Hovine, at the congress of the Société Technique, on the generator designed by him in conjunction with M. Breuillé for the production of engine gas from coke, coke dust, and other materials. Among the members who offered a few remarks upon the paper was M. Lhomme, of Nanterre, who asked the author whether he regarded coke dust as a combustible, as he used it concurrently with pieces of coke for feeding his generators. He added that, according to some trials he had made at the Nanterre Gas-Works, the coke dust employed in the generators acted rather as a moderator of combustion than as a combustible; and he expressed the opinion that the economy effected resulted more from this regulation of the combustion than from the substitution of coke dust for coke in pieces. He said one proof of this was the fact that a large proportion of the dust was found again in the ash and clinker when scurfing was being done. Another was that with a well-managed generator the quantity of fuel (large coke) used is from 12 to 13 per cent. of the coal carbonized. In the example quoted by M. Hovine, the quantity (coke and dust included) was 16 to 17 per cent., of which M. Lhomme believed 11 per cent. was coke and from 6 to 7 per cent. dust. This appeared to show, he ventured to submit, that only a portion of the added dust had in reality been utilized in the process of combustion.

We regret to learn that Mr. T. B. Jones, the Manager of the Dronfield Gas Company, and formerly of Willenhall—one of the members of the Midland Association of Gas Managers—has sustained a severe bereavement in the loss of his wife, who died last Thursday, after a long and painful illness.

LORD AVEBURY ON MUNICIPAL TRADING.

At first sight it may appear that there has of late been almost too much reiteration of the warnings against the financial policy of our municipalities; but it must be remembered that widespread interest in such matters is very difficult to arouse, and it is only by unceasing agitation that substantial progress can be made in this direction. Therefore thanks are due to those who endeavour to keep the subject in the public mind, and particularly to the Industrial Freedom League, who have for some years past conducted with untiring energy a campaign against the increase of municipal indebtedness. The names of those connected with the League must command attention; for the members include men who are prominent in Parliament and in all branches of industry. Ratepayers must not, of course, content themselves with the knowledge that there is an influential body of this character looking after their welfare. The principal aim of the League will not have been accomplished if they do not succeed in inducing citizens generally to look more carefully after their interests than they have hitherto seemed disposed to do. Under these circumstances, it is impossible to pass over without some notice the proceedings at the third annual meeting of the League (which took place last week), even though there may have been no particularly fresh arguments adduced.

The President is Lord Avebury; and in the course of a lengthy address he drew attention, in his customary quiet but convincing style, to the present condition of municipal affairs generally. He dwelt first of all upon the increase of expenditure, secondly upon that of rates, thirdly of debt, and, fourthly, what remedy could be applied. On the first three points generally it is unnecessary to say anything here, for the facts are well known to our readers; but an interesting feature was the remark made on the increase in the rates and taxes paid by the large companies. For instance, it was shown that in the twelve years from 1891 to 1903 the local rates and taxes paid by the railway companies had doubled. Similarly, the rates and taxes paid by the Gaslight and Coke Company in 1898 worked out at 2·51d. per 1000 cubic feet of gas; while by 1903 they had risen to 3·29d. "And yet," said the President, "the Gaslight and Coke Company have absolutely no voice in the expenditure of the rates to which they contribute so largely. These increases, of course, *pro tanto*, diminish the amount available for dividend; so that we are hit three times—first by the increase of assessment, secondly by the increase of the rates, and thirdly by the reduced dividends received from investments."

Coming to the much-debated question of municipal trading profits, Lord Avebury admitted that a considerable amount of the enormous debts incurred had been for remunerative purposes; but he said the accounts were very difficult to follow, and he did not think anyone could really say what profit there was, though, of course, there was no intentional inaccuracy. In the first place, it was believed that a considerable amount of clerical and accountancy work, and some of the rent of the head office applicable to the various undertakings, was in many cases charged to the general municipal account. This work corresponded with what, in a company, was paid for the secretary, solicitors, and accountants, and a portion of the rent; and it was obvious that a proper allowance must be made for these items before the real profit (if any) was arrived at. In the second place, the amount allowed for depreciation seemed much too small. In the latter connection, reference was made to Mr. J. Holt Schooling's articles in the "Windsor Magazine," which were noticed in the "Journal" at the beginning of this year. In these it was shown that if an all-round allowance was made of 5 per cent. for depreciation, there would be a net yearly loss on the 1029 "reproductive undertakings" of practically five-and-a half million pounds. While not doubting that in some cases profits had been made, Lord Avebury remarked that, when a municipality had a monopoly, and were able to charge what they liked, it was easy to show a profit on paper. As an illustration of this, he quoted the following example: "Mr. Robert Donald has pointed out that Manchester reduced its rates in 1900-1 by 7d. in the pound through municipal trading. This is the way it was done: The Corporation wanted a subsidy of £50,000 in relief of the rates from the gas undertaking; and, as there was no surplus, the price of gas was raised 3d. per 1000 feet in order to yield it. This is quoted as a profit."

It is not, however, from the financial side only that the President objects to municipal trading. He holds that, though all monopolies are bad, municipal ones are especially so, because of the difficulty of controlling or abolishing them. Another point which he urged was with regard to municipal employees. Town councillors, he said, would have to regulate the wages of their electors; and there would be a tendency to set the wages against the votes. Thus municipal governors would be placed in a difficult, if not an impossible, position. Mr. Keir Hardie had stated that in 1903, when there was a reduction in wages all round, the wages of municipal employees had alone increased, and they had doubled. The enormous influence which municipal employees could, and did, exert at local elections for purely personal objects was not, Lord Avebury added, a matter which the community could afford to regard with equanimity. He summed up his objections to municipal trading as follows: "(1) The legitimate functions and duties of the municipalities are already enough—if not, indeed, more than enough—to tax all their energies and fill up all their time. (2) It will involve an immense increase in municipal debt. (3) It will involve municipalities in labour disputes. (4) As there will not be the same stimulus to economy and attention, there will be a great probability, not to say certainty, that one of two things will happen—either there will be a loss or the service will cost more. (5) It will be a very serious check to progress and to discovery.

Turning to the remedies, the President referred to the axiom which, when he was young, was regarded as a self-evident proposition—that taxation and representation should go together, and that those who paid the rates should regulate the expenditure. At present, he remarked, matters were so arranged that many thousands had votes who paid no rates, while those who paid most rates had no votes. The London Chamber of Commerce had over and over again suggested that companies should be permitted to vote, and the Associated Chambers of Commerce had endorsed the proposal. This, he said, was all very well as far as it went; but in the case of such an undertaking as the Gaslight and Coke Company it would surely be a farce to give them only one vote. Sir R. Giffen had suggested the infusion into the existing system of having the local bodies elected by the ratepayers (each person being counted as equal), of a system of representation according to interest—the chief landlords of each district or town having special representation. As a means of inducing people to take a greater share in municipal affairs, the abolition of the compound householder was recommended, or at any rate some amendment of the system, so that every tenant should be made aware of the amount which he had to pay in rates. Then there were the suggestions made by the Joint Committee on Municipal Trading with regard to the audit of the accounts of local authorities, which had not so far been put into operation; and, lastly, the necessity for returning councillors pledged to economy.

At the conclusion of the address, a number of interesting speeches were delivered. The Hon. Charles N. Lawrence gave it as his opinion that Parliament should first of all restrict the borrowing powers of the municipalities; secondly, that the accounts should be audited by independent accountants, who would in their turn be subject to the Local Government Board; and, thirdly, that it was a matter of serious consideration whether there should not be a general disfranchisement of municipal employees, who already numbered one-seventh of the wage-earning portion of the entire population. Mr. F. W. Buxton, J.P., speaking as a banker, condemned the plan of municipalities receiving money on deposit, which he said was unsafe both for the depositor and for the local authority, besides lessening the funds available for private enterprise. Sir Alexander Henderson, Bart., M.P., remarked that the general public were now alive to the unwisdom of permitting the growth of municipal trading; the question was whether legislators had been educated to the same extent. He quoted figures to show that where the amount of borrowed money was greatest in proportion to the assessable value, there the rates were highest. Mr. A. A. Campbell Swinton, as an electrician, pointed out that of 170 municipal electric supply undertakings, 68 actually made a loss on their own showing according to the last returns available; while if a proper allowance for depreciation was made, there would in almost all cases be a deficiency. Mr. B. L. Cohen, M.P., drew attention to the fact that at Battersea municipal electric lighting works had been provided, which only 230 persons out of a population of 175,000 took advantage of; while at Fulham the figures were not much better—900 consumers out of a population of 150,000. Sir Charles Rivers-Wilson, G.C.M.G., C.B., and Mr. D. Owen also addressed the meeting.

As bearing upon some of the remarks made, it may be mentioned that the following was among the resolutions passed: "That this meeting, being of opinion that the constantly-increasing indebtedness of local authorities and the great advance in the rates are detrimental to the commerce and industries of the country, desire to urge upon His Majesty's Government the importance of local indebtedness being restricted as far as possible to the limitation of two years' assessable value, as laid down in the Public Health Act, 1875; and any increase sanctioned over such limitation should be reported to Parliament, with the reasons."

THERMODYNAMICS FOR GAS CHEMISTS.*

Professor Haber's name has become a familiar one to most readers of the "Journal" through research work which he has carried out on several matters bearing on gas manufacture, and of which reports have from time to time been given in our columns. His earlier efforts were inspired by Professor Bunte; and we believe it is to the initiative of that good friend of the gas industry that the latter's erstwhile pupil and present *confrère* was led to direct his energies to problems which have profound significance for gas men. However that may be, we may congratulate ourselves that Professor Haber's talents and diligence have been in large measure devoted to experimental work, remarkable

* "Thermodynamik technischer Gasreaktionen," von Dr. F. Haber, a. o. Professor an der Technischen Hochschule Karlsruhe i. B. R. Oldenbourg, Munich and Berlin, 1905.

both for its originality and exhaustiveness, which elucidates recondite points in gas-works' processes.

The work now before us is, however, not restricted in its scope to matters directly bearing on gas manufacture. It covers a wider range. Its basis is a course of seven lectures on the thermodynamics of technical gas reactions delivered by the author in February last. A knowledge of the broad fundamental principles of chemistry and technology was pre-supposed; and the principles of the mechanical theory of heat were evolved from these elementary facts. The matter of the lectures has been somewhat extended with a view to clearing up points which were found to be a trifle obscure. The author decided to adopt in his presentation of the theoretical principles Helmholtz's conception that chemical reaction embodies a latent heat like the simple changes of state. Accordingly, the two parts, into which the total energy in chemical change is separated, are not spoken of as free and combined energy, in the conventional manner, but as the energy of reaction and latent heat. Various reasons determined this choice. In the first place, a clear idea of latent heat can be formed forthwith; whereas the conception of combined energy demands an abstraction. Then the conceived connection of gas reactions with the dissociation and evaporation phenomena of solid substances, which theoretically and practically are closely related, is simplified by the adoption of this view. Finally, by its aid it is easy to pass on to the temperature co-efficient of maximum work, on which van't Hoff, Ostwald, and Nernst base particular speculations, and so to the conception of entropy, and therewith to Planck's views.

The influence of specific heat on the energy of gas reactions is fully treated from the theoretical standpoint on the lines followed by Helmholtz and van't Hoff. The significance which a consideration of specific heat possesses in regard to gas reactions is also fully discussed at the end of the fourth chapter. The methods of determining the values, and the numerical data which we have, are exhaustively handled in many places, so that the reader may use his own judgment in regard to them. The author's aim was not to write about theory, but about technical applications. The book is intended to serve for instruction in, and the experimental study of, technical gas reactions, and to broaden the treatment which these processes receive in the ordinary technological textbooks. It is not a handbook, and does not pretend to give full information, but only to elucidate important typical cases.

To what extent the author's aim has been attained is a question on which few classes of readers will be in agreement. The student of modern physical chemistry ought to value the book very highly; but the gas chemist who has not kept his knowledge abreast of quite recent advances and theories will find that the author at times is difficult to follow. Those whose chemical and physical training enables them to read the work with understanding will find its study a very profitable exercise in the technics of gas. In regard to the thermal conditions of the reactions of the production of producer gas and water gas, there is a great deal of information of a valuable, if somewhat recondite, character; while much may be inferred concerning the reactions involved in the carbonization of coal. The principles governing the production of lime from chalk and limestone are made clear; but this matter is one which, since the issue of the report of the recent Board of Trade Committee on Metropolitan Gas Testing, has ceased to have the direct interest for gas-works' chemists which it formerly possessed.

In order to indicate more particularly the scope of the work for the benefit of those readers of the "JOURNAL" to whom it is likely to appeal, we append a statement of the contents of the seven chapters into which it is divided. Chapter I. treats of the latent heat of chemical conversion and its relation to the energy of reaction, and Chapter II. of entropy and its significance in gas reactions. Chapter III. deals further with these relations, and shows their connection with the changes of solids. The fourth chapter gives examples of reaction occurring without change of the molecular number; the examples being classified as follows: I. Formation of nitric oxide; II. (*a*) formation of hydrochloric acid, (*b*) formation of hydrobromic acid, (*c*) formation of hydriodic acid; and III. the water-gas reaction. The fifth chapter similarly takes examples of reactions in which a change of the molecular number occurs; the examples being the following: I. Formation of carbonic acid; II. formation of water; III. Deacon's chlorine process; IV. sulphuric acid contact process; and V. formation of ammonia. The sixth chapter deals with the specific heat of gases. The seventh and last treats of the determination of equilibrium with gases, and gives some theoretical and technical observations on allied questions. In this last chapter, the temperature and constitution of the bunsen and other flames are exhaustively dealt with.

In conclusion, we would repeat that this work is most valuable to the student of the chemistry and thermodynamics of gas-works' processes; but it is one which only those who have a sound knowledge of the elementary principles of physical chemistry can hope to read with understanding. There is, of course, the further hindrance to some, that the work is written in the German tongue. The student of physical chemistry must perforce learn German as a preliminary to the study of the more advanced textbooks and theses on his subject, because they are now commonly published in that language only. The more's the pity, for many English students are thereby debarred from following up a most engrossing and profitable subject, which directly bears on almost every industrial process.

INDIA-RUBBER AS AN ABSORBER OF NAPHTHALENE.

By J. O. V. IRMINGER, of Copenhagen.

When analyses are made for the purpose of detecting the presence of naphthalene in coal gas, it is known that india-rubber tubes must not be used, as they have tendency to absorb naphthalene. This led me to make experiments in order to ascertain the amount of naphthalene absorbed by india-rubber. For this purpose, I had three small U-shaped glass tubes filled with india-rubber of good quality (2 per cent. of ash), cut in small pieces. The gas contained 5 grains of naphthalene per 100 cubic feet. A portion of our gas is treated with water-gas tar, which reduces the amount of naphthalene from about 7 grains to 5 grains per 100 cubic feet. The weight of the india-rubber in the glass tubes was 14 grammes (200 grains). After having passed these tubes, the gas bubbled through a solution of picric acid, to show when naphthalene appeared. The gas was measured, with the result that 186 cubic feet passed the tubes before the picric acid showed any signs of naphthalene. The 14 grammes of india-rubber had therefore absorbed 9·3 grains of naphthalene, or about 5 per cent. of its weight. Then 50 cubic feet of air were admitted into the tubes, and afterwards gas was again led through them; and it took up the naphthalene from 139 cubic feet of gas.

I now tried a glass cylinder filled with small pieces of ordinary india-rubber refuse, containing 28 per cent. of ash. The quantity of gas purified from naphthalene was 900 cubic feet; the india-rubber having absorbed about 2 per cent. The india-rubber was taken out of the cylinder and exposed to the air for a day or two; and then the gas was again passed through. It could now purify 750 cubic feet of gas from naphthalene.

During the experiments, the gas was examined several times, and found not to have lost very much in illuminating power. After these small experiments, it seems that india-rubber takes up from 2 to 5 per cent. of naphthalene (according to its purity); and it can be used again after having been exposed to the air. This shows how active an absorber of naphthalene is india-rubber; and it is not to be wondered at that tubes of this material cannot be used in analyses for it. If we had not other, and perhaps cheaper, methods of taking out the naphthalene from gas, there might be a possibility of using india-rubber, as it seems that it can be employed again—possibly several times—after having been exposed to the air.

Gas and Oil Engines in Sweden.

According to the report of H.M. Consul at Stockholm (Mr. A. S. MacGregor), during last year the use of gas, gasoline, and oil engines increased considerably in Sweden, and interest and confidence in them are growing steadily. It is evident that there is a wide field for these motors, especially where small power is needed. The supply is both foreign and native. Thus engines from the United Kingdom, United States, Germany, and France are to be found together with those of Sweden. Of gas-engines, the suction-gas variety seems to take the first place, and is generally employed in sizes of up to about 100-horse power. They are mostly used in factories, and for electric power stations. The majority have till now been imported from the United Kingdom and Germany; but the home manufacture is increasing. They are, without exception, of the four-cycle type. Gasoline or benzene motors are mostly of small sizes, such as 3, 5, or 7 horse power. They rarely exceed 40-horse power. The United States has so far supplied the majority of them, but several Swedish firms have begun building this class of motors. Oil-engines are to be found of all sizes from 1 up to 200 horse power.

At the first meeting of the members of the Water Committee of the Birmingham Corporation after the death of Mr. Mansergh, they formally placed on record their high appreciation of his professional services to the Corporation, as Chief Engineer in connection with the Welsh water scheme, as well as of his ability and his personal qualities. At the meeting of the Lancaster Town Council on the 28th ult., the Mayor (Mr. Heald) referred to the death of Mr. Mansergh, who had been for so many years associated with the water supply of the borough, of which he was one of the honorary freemen, and moved a resolution recording the deep regret of the Council at his loss, and expressing their most sincere sympathy with the family in their bereavement.

We have received Part IX. of the "Technological and Scientific Dictionary" published by George Newnes, Limited, under the editorship of Mr. G. F. Goodchild, B.A., and Mr. C. F. Tweney. The previous parts have been noticed from time to time as they have appeared. The one just issued extends from "Petroleum" to "Pyrazole." The article on "Photometers" is as comprehensive as can be expected for a work of the size of the "Dictionary;" and it is in no spirit of fault-finding that we point out that the Methven screen and the Lummer-Brodhun photometer are doubtless the instruments the Editors intended to mention. The subjects of the "Polarization of Light" and "Potassium Compounds" are among those which are fairly fully treated; and chemical formulæ are very much in evidence. The latest part of this useful book maintains the excellence of its predecessors.

FORMATION OF A JUNIOR GAS ASSOCIATION FOR THE MIDLAND COUNTIES.

As the result of the circular sent out to the members of the Midland Association by the Hon. Secretary (Mr. Charles Meiklejohn, of Rugby), which was referred to in last Tuesday's "JOURNAL"—p. 950—there was a large attendance of gas-works assistants at the meeting held on Saturday in the Council Room of the Birmingham and Midland Institute to consider the advisability of forming a Junior Gas Association for the Midlands. The chair was occupied by Mr. THOMAS BERRIDGE, of Leamington (the President of the Midland Association of Gas Managers); and he was supported by Mr. Meiklejohn and Mr. Harold E. Copp, of West Bromwich.

Mr. BERRIDGE, in opening the proceedings, remarked that they had met to discuss the question of a Junior Gas Association for the Midlands; and, if thought advisable, to form such as Association. He said that, in his opinion, there was a much better scope for young men at the present day in the gas profession than in almost any other profession. For a good many years past, fathers had been apprenticing their sons to electrical engineering; being under the impression that electricity was going to push gas out altogether. The consequence of this was that there was practically a dearth of well-educated young men to take up prominent positions in gas-works; and he thought—and he dared say most of those present also thought—there was a bigger and more successful future in store for gas than was ever the case before. In London now they were taking down electric lamps, and replacing them by high-pressure incandescent gas-lights; and probably in the different places where his hearers were engaged the same thing was being done. Then, again, they were making rapid strides in the utilization of gas for cooking, heating, and motive power purposes; and there was no doubt that before many years were over they would be making some sort of a blue gas, having very little illuminating value, but a high calorific power. This would be employed for all kinds of heating; and the result would be that the burning of coal as at present carried on would be practically abolished. In the first place, he would call upon Mr. Meiklejohn to give the meeting some idea of the number who had replied favourably to his communications; and then they could propose the formation of an Association and elect a Committee. They would find the advantage of meeting together very considerable. He remembered that some twenty years ago, when he was a young man and just starting in the gas world, he joined the Derby Society of Engineers; and he derived very great benefit from the practice he had in the way of public speaking and in the reading of papers there. He had talked to several men who had joined the Society at the same time that he did, and who were now holding important positions in almost all parts of the world; and all of them acknowledged that they had derived very great assistance from it. He hoped that the idea of a Junior Association for the Midlands would be taken up and worked as well as was being done in other districts. They were not behind others in ability and energy; and why should they not have a Society similar to those that flourished elsewhere, and show that they could turn out as good gas managers as other places in the United Kingdom?

Mr. MEIKLEJOHN said he wished to state one or two reasons why this meeting had been called at such comparatively short notice. The principal one was in connection with the idea of forming a class on "Gas Manufacture" at the Technical School. He found, from a conversation he had with Dr. Sumpner, that unless they could arrange a meeting between the Councils of the Midland Association and the Technical School for the beginning of July, it would not be possible to get the subject of "Gas Manufacture" included in the syllabus for the ensuing winter session. The second reason was that the gentleman who might be appointed Honorary Secretary of the new Association would find that the sooner he got to work the better it would be for preparing the programme for the coming session. He might perhaps point out that the "Gas Manufacture" class would, of course, not necessarily be any part of the Junior Association work. It would be quite independent, and would be open to anybody—members or not—to join. It would be purely a Technical School class on this particular subject. With regard to the responses which he had received to the circulars sent out as to the Junior Association and also on the question of the classes, he might say that the number of favourable replies was 52 for the Association and 56 for the classes on "Gas Manufacture." He thought this result justified them (to use the words of the company promoter) in "going to allotment." He did not know whether they would that day wish to consider the question of the rules for the proposed Association; but his own impression was that it would be preferable to appoint a Committee to prepare draft rules and submit them to a meeting to be called a little later on, when they would know better who would be joining, and be in a position to select the different officers. Of course, they must look to Birmingham as supplying the greatest number of members, and those most likely to take high office in connection with the Association; and owing to the very short time afforded, the names of those of the gas-works staff who were willing to join had only just reached him from Mr. Hack. Under these circumstances, therefore, he suggested the advisability of appointing a Provisional Committee, who might be prepared to make definite proposals at the next meeting. The members of the Committee of the Midland Association would be happy to co-operate with such a Committee in getting the rules in order, as well as to assist at the next meeting. There was one difference he should like to suggest between the regulations which governed the other Junior Associations and those which should apply to their own. This was that he thought it would be an advantage both to the Midland Association and to the Junior Association to have some connecting link between the two bodies. The other Junior Associations, so far as he knew, were quite distinct organizations; but while it was desirable that the work of the Midland Junior Association should also be entirely in the hands of the members, he thought that the idea which had recently prevailed in regard to the affiliation of the District Associations with the Gas Institution might be in some way extended to the Midland Senior and Junior Associations. To this end it might be arranged that the President for the time being of the Midland Association should be an *ex-officio* member of the Committee of the Junior Association, and that the President of the Junior Association should also be an *ex-officio* member of the Midland Association Committee. There would be no control in the ordinary sense; but the effect would be that each Committee would have some knowledge of what was being done by the other Association. As showing the advantage to be derived from these connecting links, he instanced the fact that the Institution of Civil Engineers were at the present time taking into consideration the best means of training an engineer; and they had appointed a Committee to formulate a scheme. A representative was chosen from the Institution of Gas Engineers on this Committee; and now he (Mr. Meiklejohn) had had sent to him from the Secretary of the Institution of Gas Engineers a list of questions to be answered by members of the gas industry in regard to what they consider should be the proper training of an engineer. Now, instead of the Institution Council answering these queries themselves, the different District Associations who had been affiliated with the Institution had been written to and specimen copies of the questions forwarded. Each District Association had been asked to return the names of twelve members to whom copies of this document could be forwarded to be filled up. They would see from this that the Institution being in touch with the District Associations formed a means of getting at the greatest possible number of those engaged in the gas industry, and so helped to provide a proper representative answer to the query referred to. He thought that it would in the same way be advisable to keep up some connection between the Midland Association and the Junior Association.

Mr. BERRIDGE said he thought it very satisfactory that so many were prepared to join the new Association; and it was also gratifying to know that most of the managers in the Midlands had offered to place their works at the disposal of the juniors for visits. It rested now practically with the members to make the Association a great success.

Mr. COPP said he did not know that there was anything he could add to the remarks already made, because there could not be two opinions about the advisability of forming an Association of this kind. Some years ago, he was connected with a similar organization; and he was always very grateful for the benefits he derived from it. He concluded by moving: "That it is advisable to form a Midland Junior Gas Association, and that a Committee be appointed to consider a draft set of rules."

Mr. DYSON remarked that ever since the Chairman had expressed the wish that a Junior Association should be formed, he and many others had been looking forward with interest to the starting of one. He, with pleasure, seconded the resolution.

This was unanimously carried; and thereafter the following Provisional Committee were appointed to draft the rules: Messrs. A. W. Smith, Birmingham; F. Bywater, Birmingham; F. P. Dyson, Loughborough; J. H. Willoughby, Leamington; L. Wilson, Stafford; G. Shepherd, Banbury; G. W. Tatam, Birmingham; J. Hewett, Birmingham; and S. T. Smith, Walsall; with Mr. Berridge and Mr. Meiklejohn as *ex-officio* members.

Mr. BERRIDGE announced that the Committee of the Midland Association had decided to bear all the preliminary expenses of the formation of the new Association.

It was then decided that the Provisional Committee should meet at 5 o'clock on Thursday, the 13th inst., and that at 6.15 the same day a general meeting should be held to adopt rules, elect officers, and transact any other business.

A suggestion having been made that there should be a general instruction to the Committee as to the lines on which the Association should be governed,

Mr. MEIKLEJOHN said he would like them to decide whether the President of each Association should be *ex-officio* a member of the Committee of the other. Then as to qualification. The rules of the other Junior Associations in this regard were very much alike—that members should be engaged in the manufacture and distribution of gas. The term "distribution" might be applied in a narrow or a wide sense. Would they like it to cover the whole staff in the offices, because they were all engaged in gas distribution—including the clerks and cashiers?

Mr. BERRIDGE said that in his opinion anyone on the staff of a gas company or corporation ought to be eligible to join the Association. Those at the top could always keep there; and those

at the bottom should have an opportunity of getting up if they were willing and able to take advantage of it. They should, of course, exclude makers of gas apparatus; but in other respects the qualification should be as wide as possible. It should not go forth that they only wanted those to join who could do good to the Association; they wanted all to whom the Association could do good—everyone who was willing to help himself.

Ultimately, on the motion of Mr. DYSON, seconded by Mr. BYWATER, the following qualification rule was agreed to: "Membership is open to any person holding a recognized official position who is engaged at a gas-works or at works dealing with the working up of gas-works residual products (under the control of a gas company or corporation), or otherwise associated with gas manufacture or distribution, but who is not engaged in the manufacture of gas appliances."

Proposed by Mr. S. T. SMITH, and seconded by Mr. TATAM, a resolution was next agreed to that the President and Secretary for the time being of the Midland Association of Gas Managers should be *ex-officio* members of the Junior Association.

The proceedings concluded by the passing of votes of thanks to Mr. Berridge and Mr. Meiklejohn, to which these gentlemen briefly responded.

MUNICIPAL ENGINEERS AT NORWICH.

Visits to the Gas and Water Works.

The Incorporated Association of Municipal and County Engineers were fortunate both in regard to the place of holding their recent annual meeting and in the fare provided for them. Norwich was the scene of the gathering, the incoming President being Mr. A. E. Collins, who is City Engineer there; and the programme included, among various items of interest, visits to the gas and water works. So far as "JOURNAL" readers are concerned, these visits were, of course, the most interesting part of the proceedings; but before dealing with them, there are one or two points which arose out of the business sittings that may be very briefly noted.

Beginning with the Presidential Address, we find a strong protest against the treatment of Municipal Engineers by the Local Government Board, who, Mr. Collins said, had not given these officials the consideration they required and deserved—in fact, it appears to him that they are purposely placed in an unfair position by the Board whenever it is possible for them to do so. As an example, he stated that many consents of the Board to local authorities to raise loans for works designed and carried out by municipal engineers had been conditional upon those engineers receiving no payments from the loans. At the same time, payments were authorized to clerks of local authorities whose work relative to the matters in question was not a tithe of that of the engineers; and, further, it was not prohibited to make payments from loans to engineers in private practice. Another matter with which he found fault was the instruction of the Board to their auditors to surcharge payment by local authorities of the expenses incurred by members of the Association in attending the meetings. This is a subject which has several times been dealt with in the pages of the "JOURNAL," for it is greatly to be deplored that the Board should see fit to thus place difficulties in the way of public officials obtaining information which would be of assistance to the bodies they serve. As Mr. Collins remarked, it is necessary to local authorities for their engineers to have the fullest knowledge of the progress of municipal engineering; and at the same time it is unjust for the engineers—mostly an underpaid class—to be out of pocket in obtaining such knowledge for the benefit of their employers. Yet further points urged by the President were that the Board should promote legislation ensuring superannuation to engineers, town clerks, and other officials of local authorities, now omitted from schemes of this character; and that they should also obtain from Parliament such powers as would ensure that only competent and well-paid men should hold positions as municipal engineers, and that these men, when appointed, should be protected from improper dismissal.

Among the papers read was one by Mr. Thomas Pritchard, on the water supply of Cromer, in which, after giving a history of the undertaking down to 1902, when it was acquired by the Urban District Council, the author described the works in progress at Metton for augmenting the supply. The scheme was sanctioned by the Company's Act of 1901, in which a clause was inserted, by agreement, giving the Council power to purchase the undertaking. A test borehole was sunk there in 1901, 8 inches in diameter and 203 feet deep, lined to exclude all water above the chalk; and this well has been overflowing ever since. The permanent well, which has recently been completed, is 160 feet deep, the first 125 feet being lined; and from the bottom a 12-inch borehole has been sunk 100 feet, with adits to connect with the test borehole. Already the yield is 730,000 gallons per day, or about 2½ times the maximum demand; and no doubt is felt that by extending the adits this quantity could be increased. The high-level reservoir, about 3½ miles from Cromer, is at a sufficient elevation to supply the whole area. It is constructed of concrete lined with blue brickwork, and has a capacity of a million gallons, with division walls to allow of cleaning half at a time. The pumping-station, when completed, will comprise a boiler-house, with two Galloway type boilers, engine-house, with pumping-engines in duplicate, coal-store, workshop, &c. The amount awarded the Company for their undertaking was £59,302, in addition to the debenture debt, the cost of the Company's Act, the winding-up expenses, and any outlay incurred by the Company in connection with the Metton scheme; and the total expenditure by the Council on the concern is now approaching £100,000.

The visits paid by the members of the Association to the Norwich Gas and Water Works proved most enjoyable. The water-works were inspected first; and here the company were generously entertained at lunch by the Directors of the Company. The chair was occupied by Mr. A. R. Chamberlin, the Chairman, who was supported by the Mayor (Mr. H. Z. T. Flowers), Mr. Charles Hawksley (the Consulting Engineer to the Company), and many prominent citizens. Mr. Hawksley, in proposing the toast of "Welcome to the Association," referred to the interest which the late Mr. John Ayris and his (Mr. Hawksley's) father took in the welfare of the undertaking, as well as to the harmony which existed between the present Manager (Mr. W. H. Parr) and Mr. Collins. The latter gentleman, in replying to the toast, remarked that at one time the Norwich Water-Works belonged to the Corporation, who, however, sold the undertaking to a Company. Norwich was, to the best of his knowledge, absolutely the first place in which a constant supply was used. Mr. Hawksley's father was the originator of it; and by this one thing alone he conferred a vast benefit on humanity. The assistance rendered to Mr. Hawksley by Mr. Ayris was well known in Norwich. They worked together as brothers; and it was impossible to mention any names that were more respected in the city. Mr. Parr was proving a good successor to Mr. Ayris. He (the speaker) had had experience in many towns; but he had never found works carried out and managed in such an absolutely perfect manner as the Norwich Water-Works. Among the other toasts was the "Health of the Directors," to which Mr. Chamberlin replied.

To each visitor was presented a handsomely got up and excellently illustrated pamphlet, from which we learn that the water supplied by the Company is derived by pumping from the River Wensum, on the banks of which the Heigham pumping-station is situated. There are three beam engines, each capable of pumping 2 million gallons a day; and there are also horizontal engines (now rarely employed) which will shortly be replaced by smaller engines of an improved type, to be used for rapidly filling the depositing tank and filter-beds after they have been emptied for cleaning. There are six Lancashire boilers, four of which are fitted with Green's fuel economizers. The capacity of the depositing tank is about a million gallons; and the aggregate area of the four sand filter-beds to which the water gravitates is 12,040 square yards. The filtered water is collected in small wells, connected by pipes to the pumps in the engine-houses. The Company are able to execute expeditiously all necessary repairs by means of workshops equipped with modern tools driven by a Crossley gas-engine. There are four covered service reservoirs. Two at Lakenham, about 2 miles from the pumping-station, have a total capacity of 2,400,000 gallons; and two at Mousehold (which command the higher part of the district), 3 miles from the pumping-station, have a total capacity of 2,700,000 gallons. The entire length of mains in the Company's area is about 120 miles; and there are some 25,000 service-pipe connections. The works as they now exist were for the most part commenced and completed principally from the designs of Messrs. T. & C. Hawksley.

The afternoon of the same day was occupied by a visit to the gas-works, where everything was done by the Directors of the British Gaslight Company and the Engineer (Mr. Thomas Glover) to give the members a good time. The works at St. Martin-at-Palace Plain were first inspected; and the process of gas-making was explained by Mr. Glover, who said that the station had been entirely rebuilt within the last 2½ years. Everything was so arranged that the coal was delivered by water to the works straight from Yorkshire and the Tyne district. It was taken to Lowestoft, where it was transhipped into lighters; and these lighters brought the coal to the works, where it was discharged by machinery. From the time the coal was received into lighters, it was not touched by hand. At the Gas Hill works, which were subsequently visited, the latest methods of street lighting, &c., were exhibited—by way of emphasizing a remark previously made by Mr. Glover, to the effect that the Corporation had been guilty of a little mistake in starting to light the streets by electricity.

After light refreshments had been partaken of, Mr. Collins expressed appreciation of the welcome the Association had received, and referred to the success Mr. Glover had achieved in the rebuilding of the works. It was a wonderful transformation; and it had been accomplished without stopping the supply of gas. He moved a vote of thanks to the Company and to Mr. Glover. Mr. Lobley, in seconding, said that what had struck him most was the cleanliness of the place as compared with other works he had seen. Mr. Glover, in returning thanks, testified to the great friendliness existing between him and Mr. Collins; and he also took the opportunity to remark that, so far as gas-works were concerned, he thought it was better for them to be conducted by a company, who could adopt commercial methods for pushing the sale of gas in a way that a corporation could not.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Annual Meeting at Coblenz—June 28 to July 2.

THE town of Coblenz, though the seat of the local government of the Rhine and Moselle provinces, and the most popular resort of tourists on the Rhine, has only a fixed population of about 53,000; and the influx of upwards of 1000 visitors from all parts of Germany severely taxed the resources of the local hotels on Tuesday last, when the members of the German Association of Gas and Water Engineers began to assemble for their 45th annual meeting. The attendance at these gatherings has of late years assumed such large proportions that there are now but few more than a score of towns within the borders of the German Empire competent to furnish the requisite accommodation, and many of these have not the appropriate environment for the excursions and festivities which bulk so largely in the programme of the meetings. It is true the Association does not confine its choice of meeting-places to German towns; and its experiences at Zurich two years ago, and at Vienna two years previously, left nothing to be desired—in fact, the social functions and festivities of those two years have set a standard of excellence which the members now regretfully regard as unattainable in their native towns. However this may be, the prospect of five days to be spent in the most attractive centre on the romantic Rhine, with a round of entertainments broken only, for those of a serious turn of mind, by three formal sittings for the consideration and discussion of technical questions, caused the members of the German Association to flock in large numbers to Coblenz on Tuesday last, many being accompanied by wives and daughters. The hotels of the town, with the tourist season already begun, were unequal alone to finding rooms for all, and many gas engineers sought quarters at Ehrenbreitstein, on the opposite bank of the river (under the brow of the hill on which the famed castle stands), and at other less romantic outlying places.

The German Association arranges its meeting on cosmopolitan and popular lines, which are a striking contrast to those followed at the corresponding gatherings in our own country. The membership of the Association is not confined to the managers of gas and water works. Consulting and constructing engineers, chemists, merchants, and factory-owners all find a place in its ranks; and so far as we have been able to observe, and glean by inquiry, all work and meet harmoniously together without any of the alleged objections to such a *réunion* making themselves felt. Visitors are heartily welcomed, and may participate in the functions and debates; the one bond of union being an interest, no matter of what order, in the gas and water industries. It is not needful, in this connection, to differentiate between the German and English policy in the conduct of the affairs of the respective representative Gas Associations; but there is no question that the German policy has achieved an unqualified success in its own sphere of activity. English gas managers have elected to adopt a different policy; and, whatever its merits, few will venture to hold that it has hitherto achieved as great results in the direction of advancing technical knowledge and work. Many matters in which the good so far done by the German Association stands pre-eminent will be referred to in the course of this report of the year's proceedings; and English gas men may advisedly ponder whether it would not be advantageous for them to take steps to attain similar objects.

Those who have attended the German gatherings will certainly regard this somewhat long digression as excusable; but hereafter we will let the report point to its own moral. The first item in the official programme was a reception and assembly on Tuesday evening in the large hall of the Banqueting Rooms of Coblenz. It was a scene of great amination and conviviality, aided by wine and supper provided liberally by the Corporation. Long speeches would have been out of place when members were intent on greeting one another after, in many cases, twelve months of separation; and this fact was recognized by those responsible for the few formal words of welcome. Herr E. Bentzen, the Manager of the Coblenz Gas and Water Works, which are the property of the town, briefly expressed the hearty good wishes of the municipal authorities, which had already been written on a large scroll which had earlier greeted members as they emerged from the railway station. He apologized for the absence of the Chief Burgomaster, Herr Ortmann, who was detained in Berlin by State affairs. Then hearty applause greeted the rising of the veteran President of the Association, Herr L. Körting, the Engineer of the Hanover works of the Imperial Continental Gas Association. It was his second consecutive year of office; and lightly do his three score years and eleven appear to have sat upon him. Few who watched the vigour and animation with which he expressed a genial welcome to his fellow members, and a word of hearty thanks to the civic body, could realize that he had borne for over fifty years the cares and responsibilities of the gas managership of the town of Hanover. He was followed by Dr. Janssen, on behalf of the Local Committee responsible for the arrangements for the meeting.

THE BUSINESS MEETING—THE PRESIDENT'S ADDRESS.

On Thursday, the 29th, the technical programme for the meeting was opened at 9 a.m.; and the sitting continued, with a brief interval for refreshments, until after 2 o'clock. Some 400 to 500 members were assembled together in the Banqueting Hall during this morning's meeting. Herr Körting, the President of the Association, first claimed attention for the representatives of the Government and Municipal authorities, Herr von Schütz, Dr. Salomon, and Dr. Janssen, who, in few words, formally expressed their gratification at the decision of the Association to hold the meeting at Coblenz. Herr Körting suitably acknowledged, on behalf of the Association, the sentiments expressed by the speakers, and then proceeded to deliver his inaugural address. The President's address at the German meetings is not customarily of a technical character, and is usually delivered in rather less than half-an-hour. Herr Körting followed precedent in these respects. He referred to the continued growth and prosperity of the Association, which now numbers 970 members and associates. Death had taken away eleven members during the year, of whom Mr. Edward Drory, the Manager of the Berlin works of the Imperial Continental Gas Association, and Hubert Nachtscheim, of Vienna, were signalled for special mention. All present rose from their seats when the names were given, in accordance with the German custom of paying a silent yet expressive tribute of respect to the dead. A special invitation had been extended to the members of the Association to visit Liège on July 2. The President mentioned the establishment of an experimental gas-works by the Association at Carlsruhe, in connection with the Technical Institute there. This matter came in for fuller exposition later, as will appear in the sequel. He spoke hopefully of the trials of vertical retorts which were being made at Dessau and Berlin, and thought they might prove of great advantage in gas manufacture. The address was received with hearty good will by all present. It was delivered extempore, and in the genial, and at times humorous, manner which has conduced to making Herr Körting so popular a President.

THE COBLENZ GAS AND WATER WORKS.

The first paper read was one by Herr Bentzen, the Manager of the Municipal Gas and Water Works of Coblenz, describing the works, which later in the day were visited by the members. Up to 1870-71, a French Company supplied gas in Coblenz, having a works on the site of the present municipal gas-works. In 1871, the manager of the works was arrested, and the town then proceeded with a long-mooted project for gas-works of its own. Its works came into operation that year; and the growth of the town subsequently necessitated the building of the present larger works. These do not contain any novel or exceptionally good plant; but they were erected, and have been maintained, at very low cost. The plant has been obtained for the most part from a number of small firms, and erected under the close supervision of Herr Bentzen. The figures for the cost and working charges were not actually stated by him—for obvious reasons. The works are situated close to the River Moselle; and there is railway communication to them. There are two retort-houses, each containing 16 settings of nine retorts. In one house, all the retorts are on the inclined system; in the other, half the settings are horizontals. The coal is taken from the coal-sheds, which run parallel with the retort-houses, to a breaker, and there picked up by an elevator, which delivers it into a large overhead coal-tank, from which the charging-hoppers are filled. The latter travel on an overhead rail in front of the benches. Drory's tar and liquor overflow is used. The gas passes from the hydraulic main to vertical tubular condensers, of which there are six, and thence to the Pelouze tar-extractors. There are four rotary exhausters, and from them the gas enters tower scrubbers, of which there are nine, operating in three sets of three connected in series. There are twelve purifying vessels for oxide, and three station meters. There are three gasholders—one telescopic, with a capacity of 8000 cubic metres (282,000 cubic feet), and two with only a single lift, each of half the above capacity. There is a coke breaking and sorting plant, and a sulphate works. The whole equipment appeared to be well maintained, and the works are in the exceptionally fortunate position of having to provide a nearly uniform output throughout the year, owing to the summer influx of visitors to Coblenz, and the consequent large demand then for gas for cooking purposes. The growth in the gas consumption has been extraordinarily rapid of recent years.

EXPERIMENTAL GAS-WORKS.

The second item in the technical proceedings was an account by Dr. H. Bunte, Professor of Chemistry at Carlsruhe, and General Secretary of the Association, of the experimental gas-works which will be finished this year. At last year's meeting of the Association, it was decided to proceed with the project for such a works, provided that the greater part of the estimated annual working charges was promised by those works and engineers who favoured the scheme. The Association would, in that event, furnish the sum of 70,000 marks (about £3500), for which it was estimated the whole installation could be provided. This sum was apportioned as follows: The building, £2000; apparatus, £775; and the laboratory equipment, £725. A circular asking for promises of annual contributions to meet the maintenance expenses met with a liberal response; and more than the amount

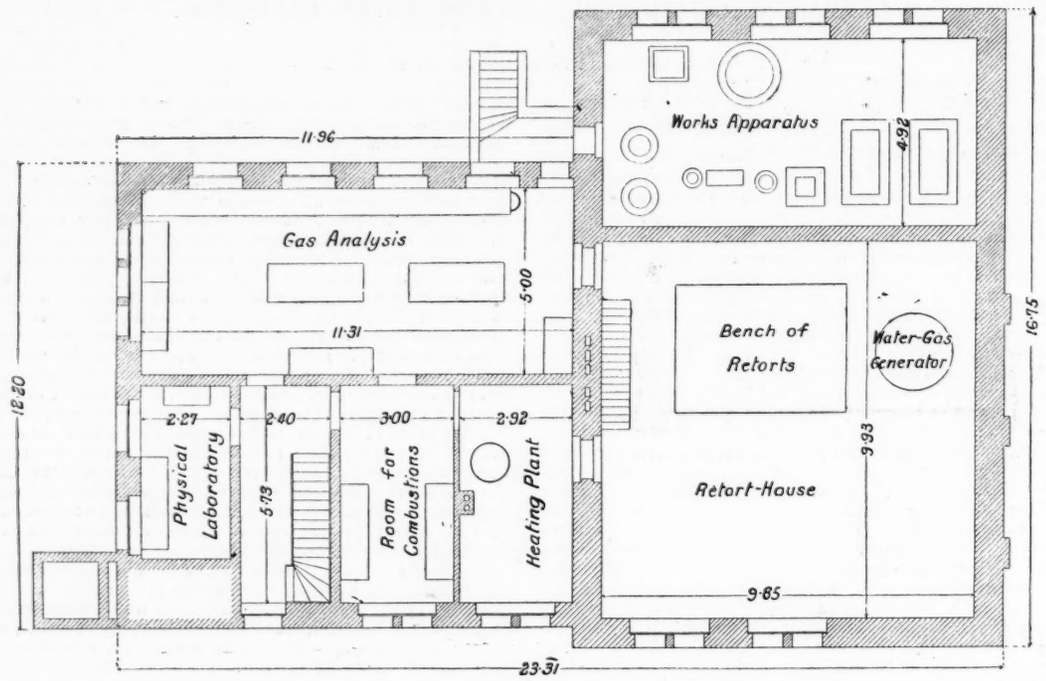


FIG. 1.—PLAN OF THE BASEMENT OF THE INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS AT CARLSRUHE.

[Dimensions in Metres—1 Metre = 3·28 feet.]

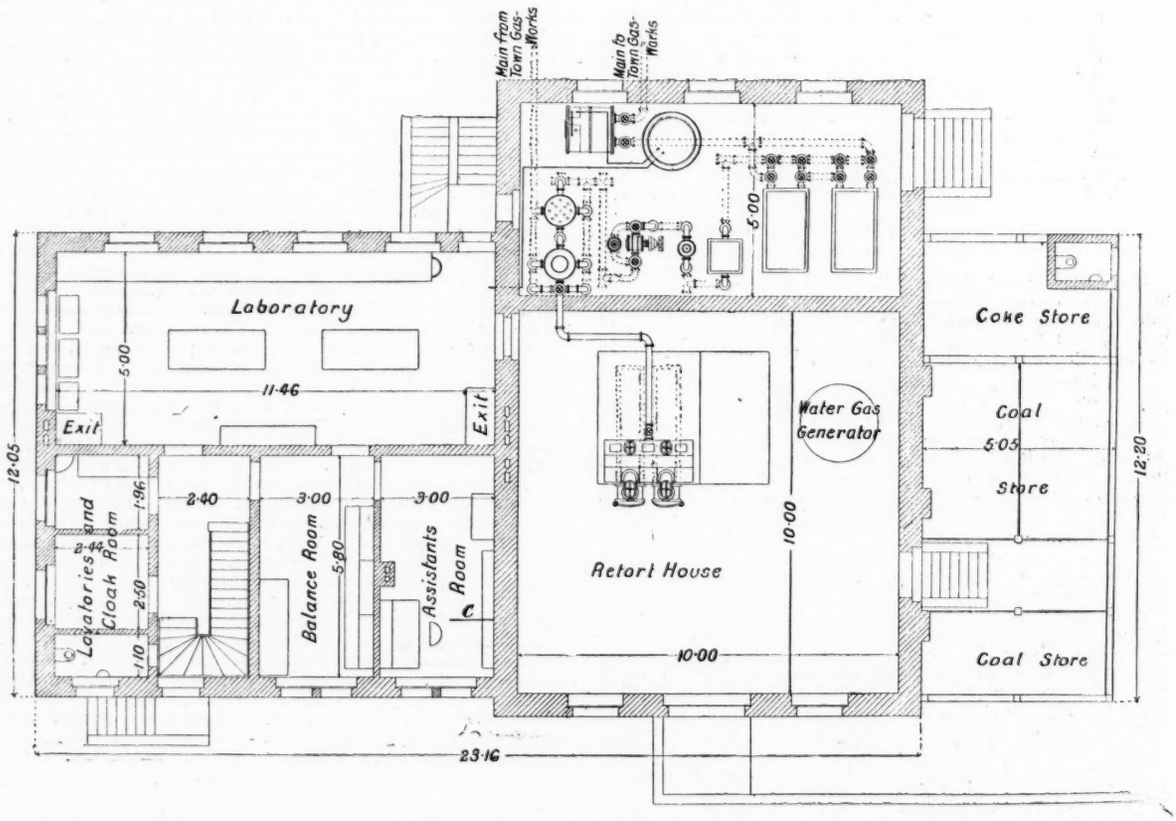


FIG. 2.—PLAN OF THE GROUND FLOOR.

of 10,000 marks (£500) required was forthcoming. The town of Carlsruhe generously agreed to provide the requisite site, alongside the municipal gas-works, for 25 years, at a nominal rent of 1 mark (1s.) per annum. A Committee was formed to carry out the scheme, consisting of the following members: Herr L. Körting, Manager of the Hanover Gas-Works, Mr. W. W. Drory, Manager of the Gas-Works at Frankfort-on-Maine, Herr F. Reese, Manager of the Dortmund Gas-Works, Herr F. Reichard, Officer of Works at Carlsruhe, Dr. H. Bunte, of Carlsruhe, Herr G. Wunder, of Leipsic, Dr. W. von Oechelhaeuser, Managing-Director of the German Continental Gas Company, and Dr. W. Leybold, Manager of the Hamburg Gas-Works. This Committee soon got to work; and plans and estimates were prepared under the supervision of Dr. Bunte. The Town Council of Carlsruhe agreed to give the head of the experimental works right of access to the town gas-works, and the use of the works plant, provided the operations of the gas-works were not thereby interfered with. They further sanctioned the laying of gas connections from the works to the experimental plant, and agreed to provide materials, products, and unskilled labour at cost price, and to take over any products of the experimental plant which could be utilized at a valuation not exceeding the cost of the same products in the town gas-works. In return for these privileges, the technical staff of the gas-wor ks have been granted the use of the experimental plant.

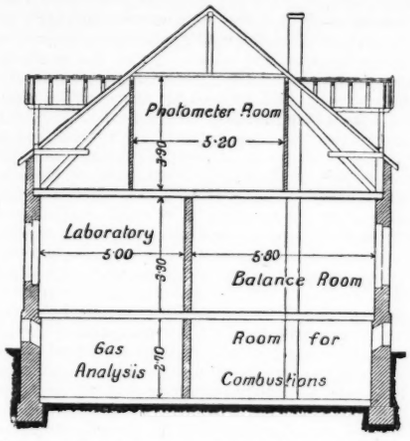


FIG. 3.—SECTION OF THE LABORATORY BLOCK.

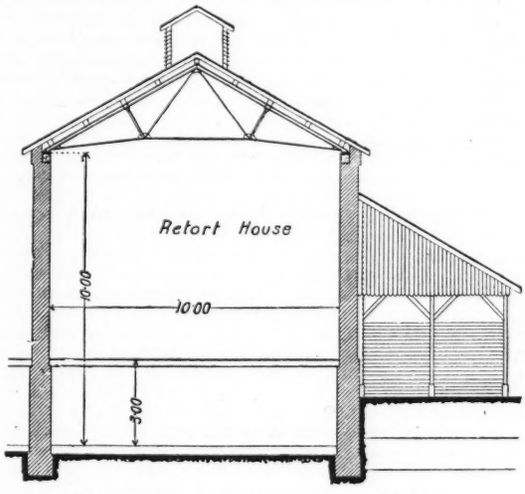


FIG. 4.—SECTION OF THE RETORT-HOUSE.

For the furthering of the scheme of providing also instruction in gas manufacture, the Senate of the Technical College at Carlsruhe agreed, at Dr. Bunte's suggestion, to found a lectureship in the "Special Technology of Gas Lighting," and appointed Dr. P. Eitner to the chair. Dr. Eitner (whose name is familiar to readers of the "JOURNAL" in connection with research work which he has carried out on questions bearing on gas manufacture) has also been appointed Director of the Experimental Works.

The erection of these experimental works will be completed this year; and it will be opportune to give a brief description of them, as they are the outcome of a novel and promising scheme, which should prove beneficial to the gas industry the world over. In Germany there are, of course, coal-testing plants on somewhat similar lines at many of the larger works. Readers of the "JOURNAL" are already acquainted with the results of work carried out in the experimental setting of two full-sized retorts, under Professor Drehschmidt's supervision, at the municipal gas-works at Berlin. There are also very similar experimental installations at Hamburg, Bremen, and Dessau. The scheme for the Association's plant at Carlsruhe is intended to give the smaller gas-works the advantages which the larger ones secure by the tests made in their own experimental settings. But it will be possible, owing to the connection of the Carlsruhe installation with the Physical Technical Institute there, to carry out research work which would hardly be possible in a gas-works, where the experimental plant must primarily be devoted to elucidating the immediate questions of practical working.

The site of the new Carlsruhe installation adjoins the gas-works, and is only some 40 feet from the large retort-house. It is approximately a square with a superficial area of about 11,000 feet. The building will comprise three principal parts—viz., the retort and apparatus house, the laboratories, and the coal and coke stores. With the exception of the wooden coal and coke sheds, all is brick built. The level of the ground floor is about 4½ feet above the ground level, which will suffice to keep the basement dry. The retort-house, which is shown in fig. 1, is separated by a wall from the apparatus-house, and is about 33 feet square and 23 feet high. The cellar below it is 10 feet high. The floor is of iron plates, supported on I-joists, so disposed that they will readily adapt themselves to any changes in form or construction of setting which may subsequently appear desirable. An iron staircase leads to the cellar.

A setting of two retorts is to be erected first, and later one with a single retort also. A water-gas generator is to be put in, as appears in the ground plans (figs. 1 and 2). The settings will be readily accessible on all sides, and will be provided with a number of openings, ordinarily closed by lids, with a view to facilitating the carrying out of physical and chemical researches on different parts of the furnace. The apparatus room, adjoining the retort-house, has an area of 33 feet by 16½ feet. It will accommodate an atmospheric condenser, a water-tube condenser, an exhauster, a bye-pass governor, an impact condenser, a washer, two purifiers, a meter, and an experimental holder. This apparatus will all be of a size to deal with the normal output of a setting of two retorts, or (say) about 18,000 cubic feet in 24 hours. The whole will be equipped with taps, &c., for taking samples and making observations at any point. In order that the experimental works may be independent of the gas production of the setting, the apparatus is to be connected by a main, with valve, with the manufacturing plant of the town gas-works. This main will be arranged to supply gas either from separate retorts or from the general foul main of the gas-works, and the connections will also admit of gas being drawn from any point in the works, mains, and plant.

The laboratory building, situated to the west of the retort-house, has an area of about 39 feet by 40 feet. The ground floor (see fig. 2) on its northern half contains the laboratory proper, having a length of 37½ feet, a width of 16·4 feet, and a height of 12·8 feet. It is adapted for detached determinations, or for a course of researches. A working bench runs along the whole of the north side; and there are to be two large working tables in the middle of the room. A fume cupboard is to be provided on the retort-house side. Smaller tables will serve for setting up special apparatus, and there will also be some small moveable tables, which can be taken to any spot about the working plant where investigations have to be made. The laboratory is shut off from the retort-house by double doors, and is connected with the apparatus-room by a covered way.

The southern half of the ground floor comprises the assistants' office, the balance and instrument room, the staircase, and cloak-room. The basement is similarly disposed, and is lit by large windows. It is intended to be used for work in which a uniform temperature is essential. The large room under the laboratory is designed for gas analysis; and the southern half is divided up into small rooms. Adjoining the cellar beneath the retort-house is accommodation for the laboratory man or stoker; while other rooms are for combustions, ultimate analyses, &c. On the west side, and shut off from the foregoing by the staircase, is a small room for physical investigations—calorimetry in particular.

A room for photometrical work is provided on an upper floor, and is of about the same size as the laboratory. Its position will be seen on reference to the sectional view of the laboratory building. It is 37 feet long. It was thought desirable to have so long a room, with a view to facilitating determinations of the lighting value of high-power burners of 1000 candles and over, without the illumination of the screen becoming too bright for accurate work. The large size of the room also prevents the air becoming appreciably vitiated during tedious photometrical readings. On both sides of the photometer-room are store-cupboards.

The coal and coke sheds are to be erected on the east side of the retort and apparatus rooms, and will be 13 feet from the railway line. The sheds will be 16½ feet wide, and 39½ feet long, split up by partitions into several sections. They should altogether hold about 60 tons of coal and 10 tons of coke. There is sufficient room on the plot of land for the building to be enlarged, should this prove necessary. As already stated, the buildings alone will cost about £2000, and the equipment of the laboratories &c., about £725. The remaining £775 is to be expended on the apparatus, of which the items are estimated to cost approximately as follows: Retort bench and hydraulic main, £212; atmospheric condenser, £17; water-tube condenser, £23; exhauster and bye-pass governor, £60; tar-extractor, £37; washer, £43; purifier, £85; meter, £45; experimental gasholder, £15; valves and connections, £175; tanks, pumps, &c., £66. It will be generally agreed that this somewhat ambitious undertaking of the Association is conceived on sound lines; and with the low cost of equipment, and small maintenance charges, that suffice in Germany, there is every prospect of success attending the venture.

After Dr. Bunte had enlarged on the scheme outlined in the foregoing, comments generally favourable to it were made by Professor Drehschmidt, of Berlin, Dr. Leybold, of Hamburg, and others. A view, expressed by one member, that the experimental setting should comprise nine retorts in order to afford results comparable with those obtainable in practical working, was not generally supported. It was agreed that though the setting of two retorts would give somewhat more favourable results, it would prove more convenient and trustworthy in use.

HEATING COMMITTEE'S REPORT.

Dr. E. Schilling, of Munich, then presented the report of the Association's Committee on Heating, of which he is Chairman. It referred mainly to the researches which have been conducted at Munich on the "Indirect Lighting of School and Lecture Rooms by Gas and Electricity," of which an account has already been given in the "JOURNAL."* The final report on these

* Vol. LXXXVII., p. 395.

investigations has now been printed and widely circulated among the interested bodies in Germany. It will be remembered that the researches established that the frequently alleged strong falling off of lighting value of gas-mantles in use was not well-founded; that there was no hygienic objection to gas lighting if adequate ventilation was afforded; and that the cost of gas lighting was much lower than that of electric lighting—being for semi-diffused lighting as 1 to 2·81, and for wholly-diffused lighting as 1 to 1·62. All charges for interest, depreciation, upkeep, &c., were included in making this computation; the figures being yet more favourable to gas if the cost of gas and current only be taken into account. As compared with electric arc diffused lighting for school rooms, &c., gas lighting was found to be quieter, more uniform, and cheaper.

The report of this Committee also referred to some prescriptions promulgated last year by Professor Rietschel of the Technical College at Berlin, with reference to the direct heating of rooms. Professor Rietschel's position as a high authority on questions of hygiene has caused great attention to be paid to his suggested prescriptions in Germany, and there is a prospect of their being embodied in a code which would bind them locally, if not generally. In so far as they refer to heating by gas, strong exception is taken to their adoption as a code; and the Association's Committee point out that such a course would present great obstacles to the use of gas for heating in Germany, and would give no really greater security to the public than at present prevails. One of the most drastic proposals of Professor Rietschel is that no bunsen flames should be allowed in gas-heating stoves. One would have supposed that English and American experience of the use of such flames would have sufficed to show the futility of such a proposal. Herr Schäfer. of the German Continental Gas Company at Dessau, had set himself the task of disposing of Professor Rietschel's case against gas heating, by direct experimental demonstration. He made a vigorous and prolonged attack on the objectionable proposals, supporting his arguments, from time to time, by reference to the working of specially equipped stoves. The matter is not one which at present directly concerns English gas engineers; but we hope later to give a fuller account of Herr Schäfer's address, which was highly appreciated at the meeting.

The Heating Committee had also had under consideration the question of the advantages of gas coke as a fuel for the furnaces of hot water and steam heating plant. They had decided to collect evidence from the larger gas-works and from makers of heating plant on the matter, and to publish it in a *brochure*.

The Gas-Meter and Other Committees' Reports.

Herr C. Kohn, the Manager of the Gas-Works at Frankfort-on-Maine, presented the report of the Committee of the Association appointed to investigate questions relating to gas-meters. It discussed the behaviour of leather and other diaphragms of dry gas-meters, with reference to the exhaustive experiments on the matter made by Dr. R. Witzeck, of Mannheim, of which a report has already been given in the "Journal,"* and further referred to new regulations in Berlin for the proving of consumers' meters. Then Herr Thomas, of Zittau, presented the report of the Association's Committee on "Photometry." This Committee are taking up questions raised by the International Committee on Photometry, which last met at Zürich two years ago; and their work is still in an incomplete stage, owing to the necessity for thorough corroboration of all measurements, and collaboration with other bodies.

The technical proceedings on Thursday closed with the visit to the gas and water works of Coblenz, already referred to; and in the evening an enjoyable concert was held in the Civil Casino, followed by dancing of an impromptu character.

(*To be continued.*)

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The Eastern District of the Scottish Junior Gas Association held their last quarterly meeting for the season in the Heriot-Watt College, Edinburgh, on Saturday. Mr. A. Masterton, the President, occupied the chair; and there was a fair attendance.

The President intimated that there had been no questions soliciting answers put into the question-box at the close of the previous meeting.

THE MANAGEMENT OF SMALL GAS-WORKS.

Mr. T. O'Neill (Dunbar) read a paper on the above subject, in the course of which he said he had been prompted to compile the paper by some remarks in the Inaugural Address of the President last October, in which he suggested and advised that members should endeavour to acquire a perfect understanding of all appliances used in connection with gas, from the retort to the burner. In the writer's opinion, a practical working knowledge of these appliances concerned intimately the managers of all small gas-works. There were, and always would be, two classes of students in the gas industry—first, those who were thoroughly trained in the higher branches of science and gas engineering, and who were likely to become leaders and specialists in the profession; and, secondly, those who served an apprenticeship to one of the allied trades in the industry, and afterwards learned the practical details of gas manufacture and distribution. To those of the latter class whose aim was an appointment in a small gas-works, he wished to make a few general remarks on the work and duties connected with the position. The majority of assistants commenced their career as managers of works with an annual output of gas ranging from 10 to 20 million cubic feet. On assuming responsibility in such works, the first thing which confronted him was the absence of departments, to which he might have been accustomed—everything now depending on his own individual control. The first and most important branch to claim attention was the retort-house. No other department required the same daily, hourly, unremitting care. One of the greatest drawbacks in retort-house practice in small works was intermittent work. This was generally due to two causes—the want of sufficient storage capacity, and an improper arrangement in the number of retorts in a setting to meet the maximum demand in different seasons. In his own case, with an annual output of about 12 millions, he formerly had three retorts in each setting of the bench. When working one of these settings, he was able to produce 30,000 cubic feet of gas per day, or 10,000 cubic feet per mouthpiece; but, with a slight increase which continued for a lengthened period, he was obliged to light another setting. Not only did this entail retorts standing idle for a considerable time, with detriment to the plant, but the sale of coke suffered correspondingly. He introduced settings of four in one-half of the retort-bench, and by working such a setting where he formerly had three retorts, he had maximum working for a much longer duration, an increased make of gas per ton of coal carbonized, less labour, a saving of plant, and a larger production of coke. A prevalent practice in small gas-works was to do without night shifts by working more retorts during the day, and charging the last round heavily and damping down, about eleven o'clock. This system of working did not, and could not, produce satisfactory results. The better method was to work one setting where formerly two might have been required right through with a night shift. Not only would there be a higher yield per ton of coal carbonized, and a steadier illuminating power maintained, but a pronounced economy effected in other directions, such as getting the night man to break all the coal for the day shift, furnace cleaning, &c., thus leaving the day men more time for odd work. After setting an oven to work he had always found it to be of material advantage to wash down the front of the bench with a hose, to carefully repoint the brickwork, and then to wash the whole front with a mixture of fire-clay and cement; also to sweep clean and thoroughly grout the top of the bench. The results spoke for themselves. Working with Ω retorts, 21 in. by 15 in., and 8 ft. 6 in. long, his average make per ton of coal for the year ending May 15, was 10,320 cubic feet. When building retorts he washed the flues, brickwork, retorts, and the inside of the arch with a mixture of lime, salt, and a little cement.

The author passed on to treat of the advantage to be obtained from careful mixing of the coal, when different qualities were used, and from the cleaning and repairing of the retorts after they had become old. Weighing the coal regularly was not, he said, a usual practice in small gas-works; but a manager could, by counting the number of shovelfuls used, tell approximately the quantity in each retort. In this simple way he could walk into the retort-house, and detect at once, without inquiry, what quantity of coal had been put in. Let them never deem anything too trifling to claim their attention. A trivial thing might save £3 or £4 per annum, which was sufficient to pay interest on £100 of capital. The difficulties to be met with in the working of the hydraulic main were then touched upon; the author preferring a long travel for the gradual cooling of the gas. The position of the condensers, and how they were exposed, and also the condensation which the gas might undergo before it reached the condensers, were matters which differed in every works; and he questioned if there were definite means to control condensers. He advocated the employment of exhausters, even in the smallest works, as the daily cost, according to a record he had kept, was 3s. 1d., with coke at 10s. per ton. As to purification, he thought that in small places the use of lime would always be advantageous. He had tried working with two, three, and four tiers of grids, and had finally adopted two tiers, with a layer of lime on each, varying from 8½ inches to 10 inches thick, according to the make of gas. It was well to have pressure-gauges on the different portions of the plant; or, in any case, the pipes should be bored and plugged, so that a portable gauge could be attached.

Distribution generally demanded far more time from the manager than the other departments; and not only his time, but also the application of his knowledge. He had to be ubiquitous and tactful, to please everybody. Main and service laying, fixing meters, gas-cookers, and gas-fires, understanding the working and parts of a gas-engine—all these things came within his individual sphere. It therefore behoved him not only to have an intimate acquaintance with, but practical knowledge of, all the appliances, from the retort-house to the burner, because in small works the manager was personally often required to perform one of the above items of duty. He had frequently wondered why it was

* See Vol. LXXXVII., p. 882.

that a commercial knowledge applicable to the gas industry had not been introduced into the *curriculum* of gas study. Method, system, and tenacity of purpose would make up for a lot of technical training.

The paper concluded with the advice to managers to keep a diary of the work they were engaged in, of the time taken in connection with it, and the amount of work got through each day, a correct note of which, he affirmed, would lay a good foundation of general information which would be useful to a manager if he were ever requested to submit a probable estimate of work to be executed.

Discussion.

Mr. J. SIMPSON (Inverkeithing) remarked that Mr. O'Neill had touched upon almost everything which the manager of a small gas-works experienced, and had dealt fairly with the various points.

The PRESIDENT complimented Mr. O'Neill upon his paper. He had said a good deal about the retort-house, and the economies to be effected therein, but not one word too much, for it was there, without doubt, that the dividends were made; and all the care and attention devoted to this department would be amply rewarded. Eminent authorities had stated that if the cost of gas were divided into 100 equal parts, about 60 would be found absorbed in the retort-house; so that it was impossible to overestimate the importance of supervision in that branch. The economy of the coal was determined there, as well as the quality and quantity of the gas produced, and also, to a large extent, the amount of the impurity to be removed. The quantity and quality of the coke available for sale was ascertained, and likewise, of course, the labour and the wear and tear of the plant. While on this topic, he should like to call the members' attention to the care and supervision which were necessary in the regulation of the dampers of the settings, and the necessity for employing intelligent men to superintend this process, which to many might seem trivial, but which to his mind was all-important, as he had known of expensive settings being destroyed through carelessness and inattention to this most essential matter. He was glad to notice, further, that Mr. O'Neill had touched upon the commercial side of the gas industry, and advocated the inclusion of this branch in the *curriculum* of technical examinations. He had often wondered at this omission; and he trusted that, now the subject had been broached, it would receive the support it merited.

BUILDING CONSTRUCTION AS APPLIED TO GAS-WORKS.

Mr. T. A. TAYLOR, draughtsman at the Granton Gas-Works, read a paper on the above subject. He said that a young man, at the beginning of his professional career, was confronted with many conflicting ideas and unknown possibilities. This, at all events, had been his experience; and he had no doubt it had also been that of many of those present. He had therefore endeavoured to present in his paper a few of the many things with which one could only become fully acquainted through practice and almost daily contact. He spoke as one who had been trained as an architect and surveyor, and having had experience of nearly all kinds of work—latterly, however, chiefly in connection with the construction of buildings designed to accommodate plant for the manufacture of gas and the bye-products derived from the destructive distillation of coal.

The first point he would wish to emphasize was the necessity for the young engineer to become a competent draughtsman, in order that he could place his thoughts upon paper in an intelligent and comprehensive manner. This, he was afraid, was sadly neglected by many; but if thoroughly acquired, it brought its own reward. He would endeavour to give a brief description of the construction of a building, from foundation to ridge, in as simple and elementary a way as he possibly could, so that any present who might not hitherto have directed their attention to it, might derive benefit from his remarks. The author entered in great detail into the requirements for securing good foundations for buildings, the materials to be used, their nature, quality, and dimensions, and the methods of working; and he dealt, under separate headings, with foundations, the damp-proof course, brick, stone, and joiner work, floors, drainage, roofs, finishings, plumbing, plaster and cement, slate, asphalte, glazier, and painter and paper work—the details being too numerous for publication. He concluded by saying he trusted his paper, which he had found difficult to curtail, might have been interesting and instructive to many of the members.

Discussion.

Mr. J. DAVIE (Edinburgh) remarked that the paper was a thoroughly practical one, and no desk production. It was complete enough for the students of gas manufacture; and even non-practical men could follow it, as it was put in so intelligible a manner.

The PRESIDENT said Mr. Taylor had endeavoured to cover a wide field. He had treated the matter of foundations thoroughly. It was his opinion that when the ground was of an indifferent character, all the skill and forethought of the engineer was required in order to secure the requisite stability of the structure at a minimum of expense. An ideal foundation should be either incompressible, such as rock, or of an equally-yielding nature, such as ordinary clay, throughout its area, so that if any subsidence were likely to take place it might be uniform all over. It should also be unalterable in its composition, and—what was perhaps of most importance—perpendicular to the thrust which was to come upon it, and of sufficient area to bear the pressure. The drainage of the site was also an item of importance, and in many cases a small well sunk in a convenient position, with drains led from the excavation to it, would prove the most economical method of keeping the foundations free from water. This was almost always done in the case of excavations for gasholder tanks; and it had saved much expense and worry. When a building had to be erected upon sloping ground, the trenches were often taken out in benches or steps; but a very good and stable method was to erect strong pens of concrete or brickwork, at distances apart varying according to the weight and character of the surface structure, and to construct arches of concrete, brick, or masonry between them, to carry the building over the intervening space. It might also be convenient to turn these arches on mud centres, where the opening was not very deep. An excellent illustration of this class of structure was to be found in the Granton works; and he felt sure it would compare most favourably with any other plan. He might also mention a cheap method of broadening the base of a foundation without increasing the cost of the trench work. It consisted of undercutting the sides of the excavation at the bottom, and packing it solid with concrete. Of course, this could only be done in fairly firm ground. He thought he might safely say that Mr. Taylor had made his paper so very clear and concise that one could almost start and construct a building from it. He would urge all the members to endeavour to obtain a complete grasp of the nature and properties of materials, to learn how to single out the best articles, and how, almost at a glance, to be able to say whether any particular material was suitable or otherwise for the purpose for which it was intended. He concluded by moving a hearty vote of thanks to their friends for their excellent papers.

Mr. O'NEILL and Mr. TAYLOR having acknowledged the vote,

Mr. D. BUIST (Granton) proposed a vote of thanks to the President.

The PRESIDENT said he felt more the debtor than the indebted in this case, as presiding over their gatherings. As this was the last meeting of the session, it might not be out of place to say that, on the whole, the retrospect was a favourable one. They had much upon which to congratulate themselves. He hoped to have an opportunity, at a later date, of giving a detailed account of the work accomplished; and he would only now say that they had had excellent papers, attentive and appreciative audiences, harmonious and instructive discussions, well-attended meetings, and excursions to various centres of industry. He was much obliged to the members for the unfailing support they had given him. He should always have the interest of the Association at heart, and he hoped it would have an unparalleled success.

It was intimated that the first meeting next session would be held on Saturday, the 7th of October.

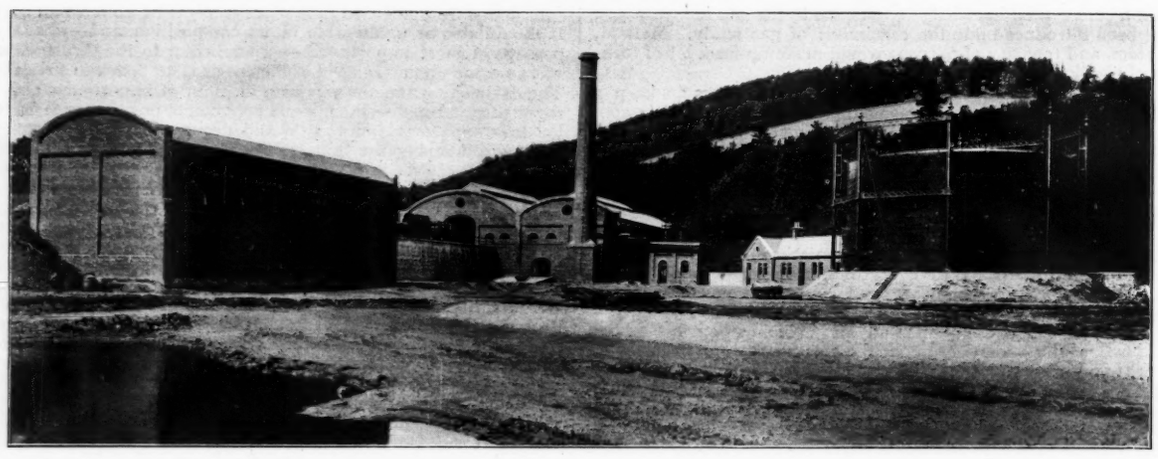
NEW GAS-WORKS FOR PEEBLES.

The new gas-works which have been erected for the Corporation of Peebles were formally opened on Saturday; the inaugural ceremony being performed by Mrs. Ballantyne, the wife of the Provost of the burgh.

In connection with this event, it will be of interest to record that a Gas Company was formed in Peebles as early as the year 1829; and they continued to supply gas in the burgh till 1898, when the Corporation acquired the undertaking. The process of transfer was a peaceful one; and it has proved, without doubt, the most advantageous step the Corporation have ever taken on behalf of the community. The capital of the Company at the time of the transfer amounted to £5800, and the purchase price was £10,763. The works, which were in good condition, were capable of providing about 16 million cubic feet of gas per annum, with, it was believed, a possibility of their being extended so as to produce 20 millions. But this figure has been passed for some years; and the old works have, though with much difficulty, been made equal to the demand, which last year was as much as 29,734,500 feet. This large increase has been chiefly due to the policy adopted by the Corporation in the matter of the supply of gas cookers and fires. This policy has been to supply and fix free of charge all appliances up to £2 10s. in value, and to furnish a prepayment meter to each; the price of the gas consumed in this way being the same as through ordinary meters. For appliances above £2 10s. in value, a nominal rent is charged.

DESCRIPTION OF THE WORKS.

Owing to their situation, at the junction of the Eddleston Water and the River Tweed, it was seen to be impossible to extend the old works, and it was resolved to remove them to an altogether new site. This was secured at Espiels, on the banks of the Tweed, about 1¼ miles below the town of Peebles. The ground, which measures some 5 acres, was acquired from Sir Duncan E. Hay, Bart., and is admirably suited for gas-works. It is triangular in shape, one side being bounded by the North British Railway to Innerleithen; and as the railway at this place runs

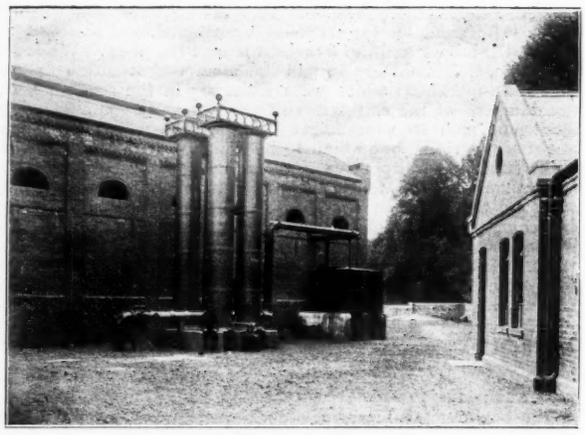


General View of the Peebles New Gas-Works.

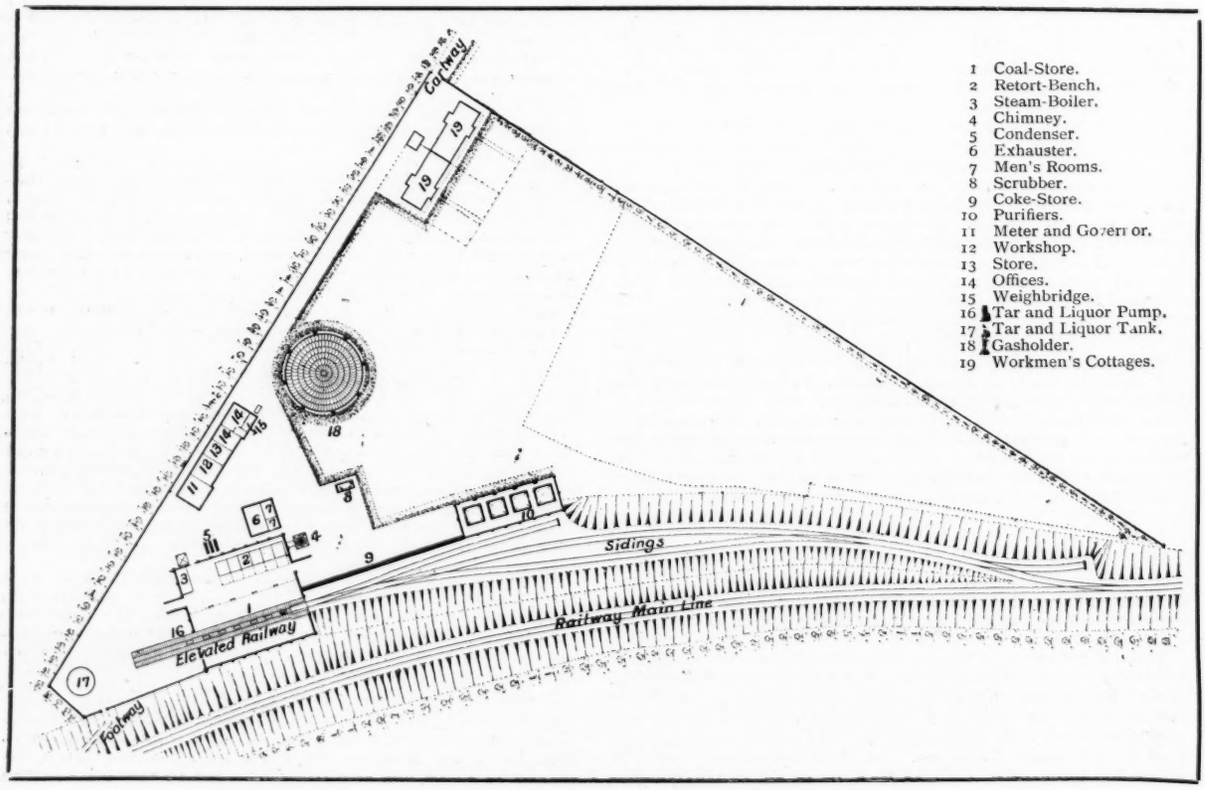
on an embankment of considerable height, the making of an elevated siding into the works was comparatively simple. The natural surface of the ground being rather lower than the highest flood-level of the Tweed, it was necessary to raise the finished floor-level so as to prevent the possibility of flooding. The works were arranged by Mr. Alexander Bell, the Gas Engineer and Manager to the Corporation, and their construction has been throughout under his personal supervision.

The coal-store and retort-house are in one building, 98 feet long by 88 feet wide, covered with a corrugated steel roof in two spans, the valley of which is carried upon joists and columns. Through the middle of the coal-store, the elevated railway is carried on brick and concrete piers and steel joists at a height of 12 feet above the floor-level. Hopper-bottomed waggons are being obtained by the Town Council, which, in conjunction with the elevated railway, afford the simplest and most economical means for handling the coal supplies in works of this size. There is storage for about 1000 tons of coal, which, at the present rate of consumption, is equal to three months' winter supply.

The retort-bench lies parallel with the railway, and consists of six ovens, five of which contain six retorts, 21 by 15 inches, and 9 feet long, or 30 retorts in all. The setting is of a simple shallow regenerative type, and is similar to that adopted by Mr. Alex. Bell, sen., at the Dalkeith Gas-Works, where it has been giving excellent results. At the other end of the retort-house is a 20 by 6 feet Cornish steam-boiler, which supplies all the steam



The Retort-House, Meter-House, Condenser, Tar and Liquor Separator, and Store Tank.



Plan of the Royal Burgh of Peebles New Gas-Works.

required for the furnaces, exhauster engine, pumps, &c. The chimney stack is 4 feet internal diameter, and 88 feet high above the ground-level.

The condenser is of annular form, and consists of four columns 3 feet diameter and 23 feet high, arranged in two pairs, with bye-pass valves. The exhauster is one of Messrs. R. Laidlaw and Son's three-blade type, with a steam-engine combined on one bed-plate; and it has a capacity of 15,000 cubic feet per hour at 100 revolutions per minute. The exhauster-house is lined with white enamelled bricks, and space has been provided for a larger duplicate exhauster. In the same building there is a lavatory for the use of the workmen. It is finished with white enamelled bricks, and fitted with an enamelled bath and two washhand basins. This building is surmounted by a water-tank, which is required for dealing with the surface water, as there is no drainage off the site.

The scrubber is one of the Young type, rectangular in shape, with twelve trays, and capable of passing about 20,000 cubic feet per hour. There are four purifiers, each 15 feet square and 5 feet deep, arranged in line with six four-way valves and connections. Above the purifiers, and level with the railway, is a steel and cement concrete floor for the preparation of the lime and oxide of iron.

The station meter has a capacity of 20,000 cubic feet per hour. The gasholder is a two-lift telescopic one, with cast-iron tank and ordinary guide-framing, and having a working capacity of 130,000 cubic feet. A 12-inch Cowan water-loading governor stands in the meter-house, from which a 12-inch main is carried to the High Street of Peebles.

A cast-iron underground tar and liquor store-tank, holding 20,000 gallons, is placed at the west corner of the works. From this tank, a 6-inch Tangye special pump lifts the tar and liquor direct into the railway tank-waggons; and by the use of a diverting valve and a return pipe, the necessity for an overhead storage-tank is overcome.

The plant throughout the works has been, as far as possible, so arranged that it may be put out of action for cleaning or repairs without having to stop the make of gas.

Two handsome semi-detached cottages have been built on the site for two foremen; the accommodation of each consisting of a parlour, kitchen, scullery, and two large bedrooms. The works are enclosed by a brick and cement boundary wall, 6 feet high and 500 yards long. They are approached on one side by a fenced steel gangway formed along the Railway Company's embankment, and by a fenced cartway on the opposite side. As they stand, they are capable of producing at least three times the present output of gas; and there is abundance of room for extension when required.

The principal Contractors were: Mr. T. Topping, Edinburgh (excavations and concrete work); Messrs. John Dennis and Co., Dalkeith (brickwork and chimney); Messrs. C. M. & J. Hamilton, Hamilton (retort-bench); Mr. John M'Ewan, Greenock (roofing and other steel work); Messrs. H. Balfour and Co., Limited, Leven (gasholder, purifiers, scrubber, retort-bench mountings, condenser, and tar-tanks); Mr. G. Sinclair, Leith (steam-boiler); Messrs. R. Laidlaw and Son, Edinburgh and Glasgow (exhauster and station meter); Messrs. Parkinson and W. & B. Cowan, Limited, Edinburgh (governor); and Messrs. D. Y. Stewart and Co., Glasgow (cast-iron pipes). The total cost of the works will probably exceed £21,000.

The Opening Ceremony.

A large company, including some of the leading gas managers in Scotland, assembled in the gas-works at two o'clock in the afternoon. Mr. A. Bell, jun., the Manager, proceeded to explain the different parts of the works and plant. Beginning with the retort-house, the visitors were shown the charging of a retort by hand, after which Mr. Bell emptied a waggon-load of coal from the overhead railway. An itinerary of the works was then started; the company following the course of the gas till it leaves the works. Above the main near the boundary wall a platform had been erected, in the centre of which a valve had been fitted, and at the back of the platform was a large semi-circle with a hand pointing to "gas off." At the close of the inspection, the members of the Town Council, and a few others, assembled on the platform for the opening ceremony.

Mr. Bell said they had now come to the last, but not by any means the least, interesting of the day's proceedings. He felt highly honoured in having entrusted to him the most important duty which he was now about to perform. In their inspection of the works they had followed with the greatest interest the many operations involved in the manufacture of gas, from the time the coal was charged into the retort till the time the purified gas was delivered to the burner. He had in his hand a handsome gold key, with which he had now to ask Mrs. Ballantyne, the wife of the Provost of the burgh, to unlock the valve and to turn on the gas.

Mrs. Ballantyne having unlocked and removed the padlock with which the handle was secured, turned it full on, the hand on the indicator—a temporary arrangement—at the same time moving round till it pointed to "gas on."

Mr. Bell then, on behalf of the officials, asked Mrs. Ballantyne to accept the key as a souvenir of the part she had played in that interesting ceremony, and as a memento of a most important event in the history of the ancient Royal Burgh of Peebles.

Bailie Dalling proposed a hearty vote of thanks to Mrs. Ballantyne for having performed the ceremony.

Provost Ballantyne, on behalf of his wife, returned most hearty thanks—first, to the officials of the Peebles Gas Commissioners, for presenting her with so beautiful a key; secondly, to Bailie Dalling, for moving the vote of thanks to her; thirdly, to the company, for the way they accorded it. At that time, perhaps, a word or two from him about the initiation and carrying through of the new works might be of some interest. About ten years ago the Town Council began to think that it would be a good thing for the town and everyone concerned if they could purchase the gas undertaking. Negotiations were therefore entered into. In most cases gas undertakings were acquired by arbitration; but they felt that if they could possibly manage to obtain the undertaking without arbitration, it would probably be better for everybody interested, because arbitration was a most expensive way of acquiring a gas-works. He thought they had reason to congratulate themselves upon having found the Directors of the Peebles Gas Company a very reliable body of men; and he had no hesitation whatever in saying that, with regard to one of them in particular—Mr. Wm. Young, of Priorsford—that from his outstanding knowledge and long experience he was able to put them on the right lines, and that he had a great deal to do with the bringing about of an amicable settlement. He thought that the settlement which was arrived at was a fair one for the shareholders of the Company, and that the Commissioners had reason to believe that they made a very good bargain. When they acquired the undertaking, the make of gas was something over 13½ million cubic feet a year. The Commissioners immediately set about seeing how they could increase the sale of gas, because by an increased manufacture they were more likely to be able to reduce the price of gas, and so make it a paying concern for the community. An exhibition of gas-cookers was held; and the result was a phenomenal success. The fact was that, he thought, 90 per cent. of the houses in Peebles had now gas-cookers; and the consequence was that, instead of a make of 13½ million cubic feet, during the past year they made 29⅜ millions. But a success like this was not without its penalties. The fact that the consumption of gas was increasing so rapidly very soon made it evident that they would require to procure new gas-works. The acquiring of a site for the new works, and the designing and completing of the works, required a very great amount of consideration. They were indebted to the Hay family, as the inhabitants of Peebles had often been before, for giving them that excellent site. He did not profess to be a gas expert; but he thought, from what they had seen, that the works must commend themselves to all, and that, for a town of the size of Peebles, more excellent and more suitable gas-works did not exist. It was another example of their public-spiritedness that the Hay family, at the risk perhaps of spoiling the beauty of part of their estate, gave them the site. They were exceedingly indebted to Mr. Bell, their able Manager, for the excellent way he had carried out the works. It might be news to many of them that Mr. Bell, and Mr. Bell alone, had designed the works and carried them out. The Gas Commissioners gave him an absolutely free hand; and that their confidence had been well placed he thought they would all admit, as the works, he believed, were second to none in Scotland. He asked them to accord Mr. Bell a hearty vote of thanks.

Mr. Bell, in returning thanks, said it had been the greatest pleasure to him to show them round the works. He was afraid the Provost's remarks about him were much too flattering. No doubt the great works entailed a lot of extra labour upon him, but he was only doing his duty; and it was a pleasure to him to watch the gradual change from a turnip field to a full-blown gas-works. His labours were very much lightened by the loyal way in which he was supported by the Council, whose desire throughout the whole undertaking was to provide works which would be a credit to the town. Then he could not forget how well he had been supported by the Contractors, the workmen, and the officials, all of whom deserved the greatest credit for their labours. Peebles now possessed gas-works which he was sure they would agree with him were a credit to all concerned. The event was a red-letter day in the history of Peebles; and he trusted that the success which had attended the opening of the works that day was a forecast of much greater success in the future.

This closed the opening ceremony. On returning to Peebles, the company gathered in the large hall of the Chambers Institution, where the freedom of the burgh was conferred upon Sir Duncan E. Hay, of Haystoun, upon whose estate the new gas-works have been erected. The presentation was stated, in the minutes of the Town Council, to be in recognition of the friendly relations which have so long existed between the burgh and the Hay family. Cake and wine were served; and several toasts were honoured.

Later, tea was provided for a large number of the guests of the Corporation in the Town Hall—Provost Ballantyne presiding.

Provost Ballantyne, in thanking the visitors for their presence, remarked that to pay for the new works they would have to still further increase the consumption of gas. They had during the last seven years more than doubled it; and they wanted to double it again during the next seven years. It seemed to him that they would require to say to the people that they had got to pay for the new works in some way or other, and that they would either have to use more gas or pay a higher price for it. The way they had boomed gas in Peebles had been by means of cookers. He thought that if they could provide a means whereby a supply of hot water could be got almost instantaneously, this would be a good supplement to the gas-cooker. It seemed to him that along these lines, and also in the heating of rooms, was the way to increase the output of gas.

Mr. A. Wilson (Glasgow) expressed the indebtedness of all to the Gas Commissioners of Peebles for the invitation to be present that day. This was not the first time that the gas profession had journeyed to Peebles. He remembered coming there, along with many more, to get lessons with regard to oil-gas enrichment. They learned a good deal in those days. There were men of light and learning in Peebles. They had got Mr. W. Young, of Priorsford—a man they all looked up to as having a thoroughly sound grip of gas manufacture. They all got a great deal of information about enrichment at Peebles; and though they might not have followed quite on the same lines—especially in Glasgow, where the late Mr. Foulis worked on a method quite his own—their ideas were, he believed, got from the Peebles process. They operated their oil-gas plant till a short time ago, when they put it on the

scrap heap, as they had come to believe that enrichment was a mistake. They were going to sell gas without enrichment at all; and he believed this would be better for the Corporation and for the community. They had brought the gas down to 18 candles; and they were not nearly at the end of their rope yet in the reduction of illuminating power. The Peebles Gas Commissioners were to be congratulated upon having thoroughly good works—works in which the economies, compared with the old ones, would go a long way to pay the extra capital charges. If the Commissioners would only arrange to bring down the illuminating power of the gas, and make a good coke, they need not go outside Peebles for anything they might want to enable them to pay their way.

Mr. A. Bell, sen. (Dalkeith), was of opinion that poor gas would not do in Peebles. There was, he said, no doubt it was Mr. Williamson, the Gas Treasurer, who had made such a success of the industry in the burgh; and there was no doubt that the new works would enable them to manufacture gas much cheaper.

Treasurer Williamson suggested that if they supplied cheaper gas for trade purposes—it was already 2s. 11d. per 1000 cubic feet—they might get the manufacturers in the town to give up generating electricity by steam-engines, and to use gas-engines instead; and not only for electricity but all their work. He believed the Provost would be very willing to set an example in this direction, if they could only produce the gas cheap enough.

Mr. G. R. Hislop (Paisley) proposed a vote of thanks to the Provost of the town, for the very handsome and generous way in which he had entertained them.

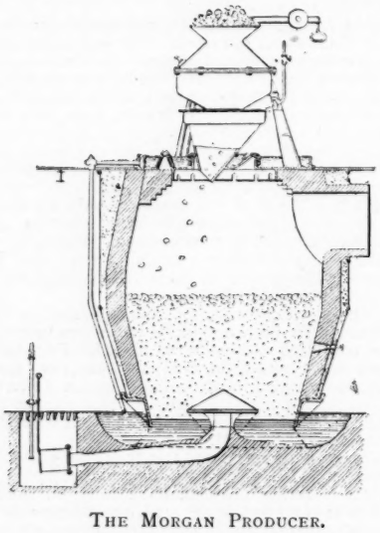
Provost Ballantyne's acknowledgment brought the proceedings to a close.

NOTES ON THREE PRODUCERS:

THE MORGAN, LETOMBE, AMD HOVINE-BREUILLÉ.

The Morgan Producer.

Three gas-producer papers were presented to the recent meeting of the Société Technique du Gaz. The first was by M. Thelliez, who described the application of the Morgan producer to the manufacture of gas for heating retorts. The author thinks that in every regenerative setting of retorts there is always insufficient room for recuperation so as to allow it to have the space and power that it ought to have. Thus arises the idea of separating the producer from the bench itself. This idea, up to the present, however, has not led to great results, because a large amount of heat has been lost; and if the change has been adopted only with a view to the better recuperation, there has been no great economy.



The Morgan Producer.

A new producer, known as the Morgan, which is derived from the Wilson producer, has the advantage of almost entirely doing away with labour, and can also be fed with the poorest fuel, such as sweepings, waste, and dust from washing, &c. The Morgan producer consists of a sheet-iron cylinder, narrowed towards its base, and furnished inside with a refractory lining. Two sizes have been adopted, both 3·50 m. (nearly 11 ft. 6 in.) high. The first type is 3·05 m. (10 feet) outside diameter, and consumes 7 metric tons of fuel per twenty-four hours. The second type is 3·65 m. (nearly 12 feet) diameter, and consumes 12 tons. In the centre at the top of the producer is an automatic distributing apparatus, which continuously spreads the coal equally over the whole surface. If there are a good number of producers to be supplied, the coal is fed mechanically into a primary receptacle, whence it goes into a funnel, worked by a rotary motion round an arc. The coal is scattered, piece by piece without interruption; always leaving a level fuel bed. A double hydraulic joint at the top prevents communication between the producer and the outside air. In producers of other systems, a large quantity of coal is charged from time to time, which results in an immediate and superabundant supply of gas, rich in carbon and tar. Then follows a period of quiet, during which good gas is obtained, but the quantity of which does not fall off until it becomes necessary to make a second charge.

The regular distribution of coal has the advantage that the air and steam traversing the mass always meet the same resistance (which means regular and complete distillation); whereas in other producers the air and steam pass with difficulty through uneven heaps, whence arise irregularities, excess of carbonic acid, large clinker, and loss of fuel. The whole base of the Morgan producer is plunged in a water tank; and in the middle at the bottom, under a conical hood, is the blow-pipe which receives the mixture of steam and air. This mixture can be regulated as desired, which is a great advantage, because the regulation can thus be affected so as exactly to meet the needs of different kinds of fuel. By this special but simple arrangement, the distribution of air and gas is effected equally over the whole surface; the porous ashes and clinker suck up the water and give up all their heat to the rising gas; the most caked clinker becomes split up, and can be drawn out as easily as the ash, without the producer itself feeling the slightest shock; also the biggest clinker can be taken out without the least inconvenience.

Tests of the Morgan producers show that they can use very poor coals, even containing up to 70 per cent. of ash. The average analysis of the gas from ordinary coal gives—

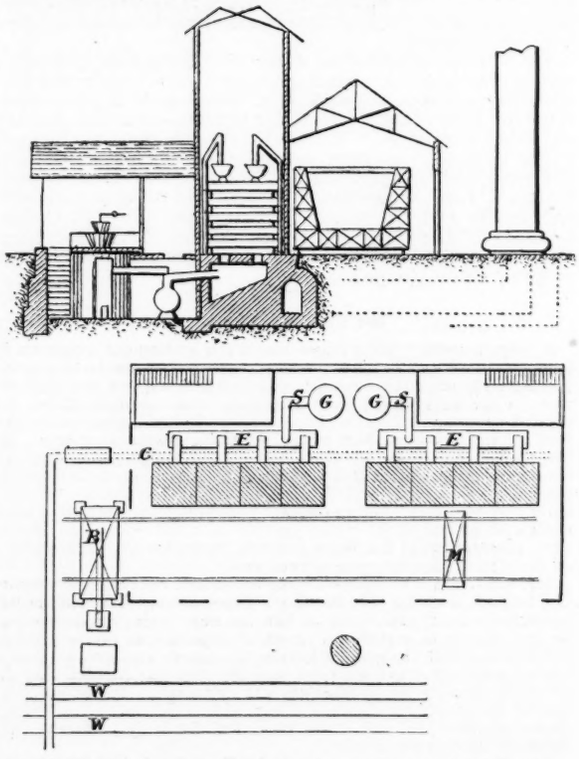
Carbonic acid	4·0 per cent.
Carbonic oxide	25·5 ,,
Light carburetted hydrogen	3·9 ,,
Olefiant gas	2·1 ,,
Hydrogen	17·8 ,,
Nitrogen	46·7 ,,
	100·0

In general, the gas produced contains 88 per cent. of the calorific capacity of the coal used. The production of carbonic acid never goes beyond 1·5 per cent., and the amount of fuel still contained in the residue does not exceed 1 per cent. To sum up, the Morgan producer offers three great advantages:—

1.—Absolute regularity in working; always equal production of the same gas, without shocks and interruption; great freedom in power controlled as desired with a given pressure, and hence maximum yield in calories.

2.—Hardly any labour.

3.—Possibility of using the most variable and least valuable fuel, because in many cases the calorific value of fuel is far from being in proportion to its real commercial value.



The Morgan Producer Adapted to Retort-House Use.

One Morgan producer could be adopted for a set of four beds, or one producer to 44 retorts, 3·50 m. (11 ft. 6 in.) long. The elasticity of the apparatus would enable the production to be varied according to the lighting up or letting down of the beds. An installation (as illustrated), with two producers and plant to carbonize 80 (metric) tons of coal per 24 hours, would make 24,000 cubic metres (847,600 cubic feet) of gas, and would require two squads of men, each consisting of a machinist, two stokers for retort-lids and ascension-pipes, one fireman; total, four men.

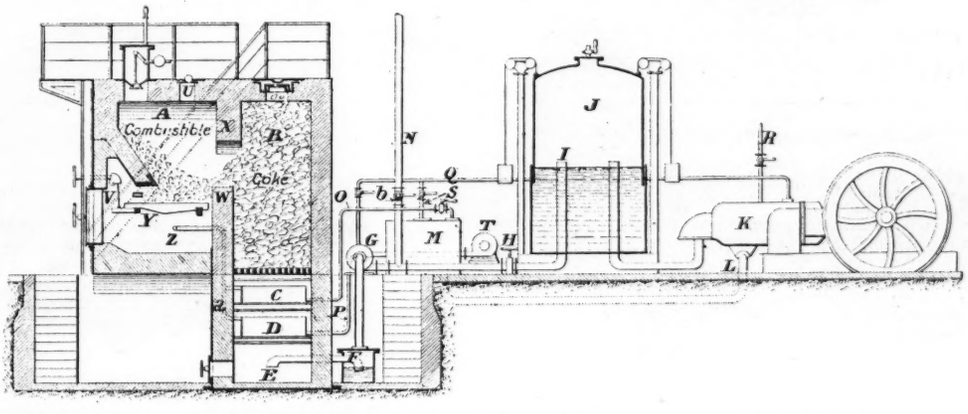
The Lille plant showed where modifications had to be made; firstly, in having sets of four or five beds, and, secondly, in doing away with a single roof to cover the beds and machines. Beds of gas-retorts can never be too free from above, so hard is the work of the pipe-jumpers. Directly one tries to avoid labour and to facilitate working, a special form of construction becomes imperative. Such a design is shown in the illustration, and consists in covering only the bench with a very high roof; thus forming a sort of chimney, and allowing the men to clean and burn out the ascension pipes without being inconvenienced by the clouds of smoke arising therefrom. On the right is a very light roof just to cover the machines; and on the left a shed, or lean-to, for the producers.

The Letombe Producer.

The second gas-producer paper was merely a page of figures compiled by M. Coze, giving the results of eleven tests of the Letombe producer. The fuel used was very small and medium coke, and the average calorific power per cubic metre of gas at 0°C. and 760 mm. was 1104 kilo-calories with steam condensed, and 1073 kilo-calories with steam uncondensed. The average composition of 1 c.m. or 1000 litres of the gas was: Carbonic oxide, 290 litres; carbonic acid, 40 litres; hydrogen, 70 litres; oxygen, 0 litre; nitrogen, 600 litre—total, 1000 litres.

The Hovine-Breuille Producer.

The third paper was one in which M. Hovine himself described the Hovine-Breuillé producer, using as fuel, coke, waste, or coke dust. M. Hovine may also be remembered as part designer of a system of producer and regenerative furnace specially intended for heating retorts in works where it is desired to use coke breeze as fuel. He says in his paper that coke and its derivatives are too abundant bye-products in gas-works for it to be possible to sell them at their real calorific value. There is therefore every reason to develop their being utilized on, and for the need of, the works themselves, so as to avoid lowering the sale price. This has affected to some extent the question of the economical heating of retorts, and has also led to the adoption of water gas, which has partly utilized the coke and reduced the amount that would otherwise have been made by coal carbonization. Further, the extension of mechanical appliances, the establishing in gas-works of electrical stations, either for lighting or driving purposes, and, in short, all demands for power, have opened up a new and advantageous market for gas coke. To use it, however, is not so simple as it looks. Boilers are costly, bulky, and cumbersome; their power is limited by the quantity of coke consumed; and if used directly under the boilers, the yield in steam is only moderate, and the regulation of the fire rather delicate, especially with breeze. The use of coke in a producer is economically much to be preferred; the cost in fuel per horse-power-hour falling from 1000 or 1200 grammes (2·2 or 2·6 lbs.) with steam to 500 or 600 grammes (1·1 or 1·3 lbs.) with producer gas. The apparatus is simple, and the working easy when the fuel is good like English anthracite or metallurgical coke. But with some coke and thin coals, difficulties come about from clinker; and, in spite of frequent raking out, the zone of combustion rises, and after two or three days the producer has to be completely cleaned out. These experiences led M. Hovine to study the question; and last year, at the Exposition du Nord de la France, at Arras, he was able to show a Hovine-Breuillé producer supplying a 100-horse power gas-engine with poor gas.



A Producer.
B Regulating chamber.
C Steam superheater.
D Air-heater.
E Gas-outlet.
F Hydraulic joint.
G Suction ventilator.
H Gasholder valve.
I Gasholder inlet.
J Gasholder.
K Engine.
L Exhaust gases from engine.
M Boiler.
N Outlet to open air.
O Steam piping.
P Air piping.
Q Hot-water piping.
R Cold-water inlet to engine.
S Hot-water inlet to boiler.
T Blower.
U Fire pricking hole.
V Grate motion.
W Fire-bridge.
X Partition.
Y Special swing grate.
Z Steam inlet under grate.
a Hot-air inlet under grate.
b Outlet valve to open air.

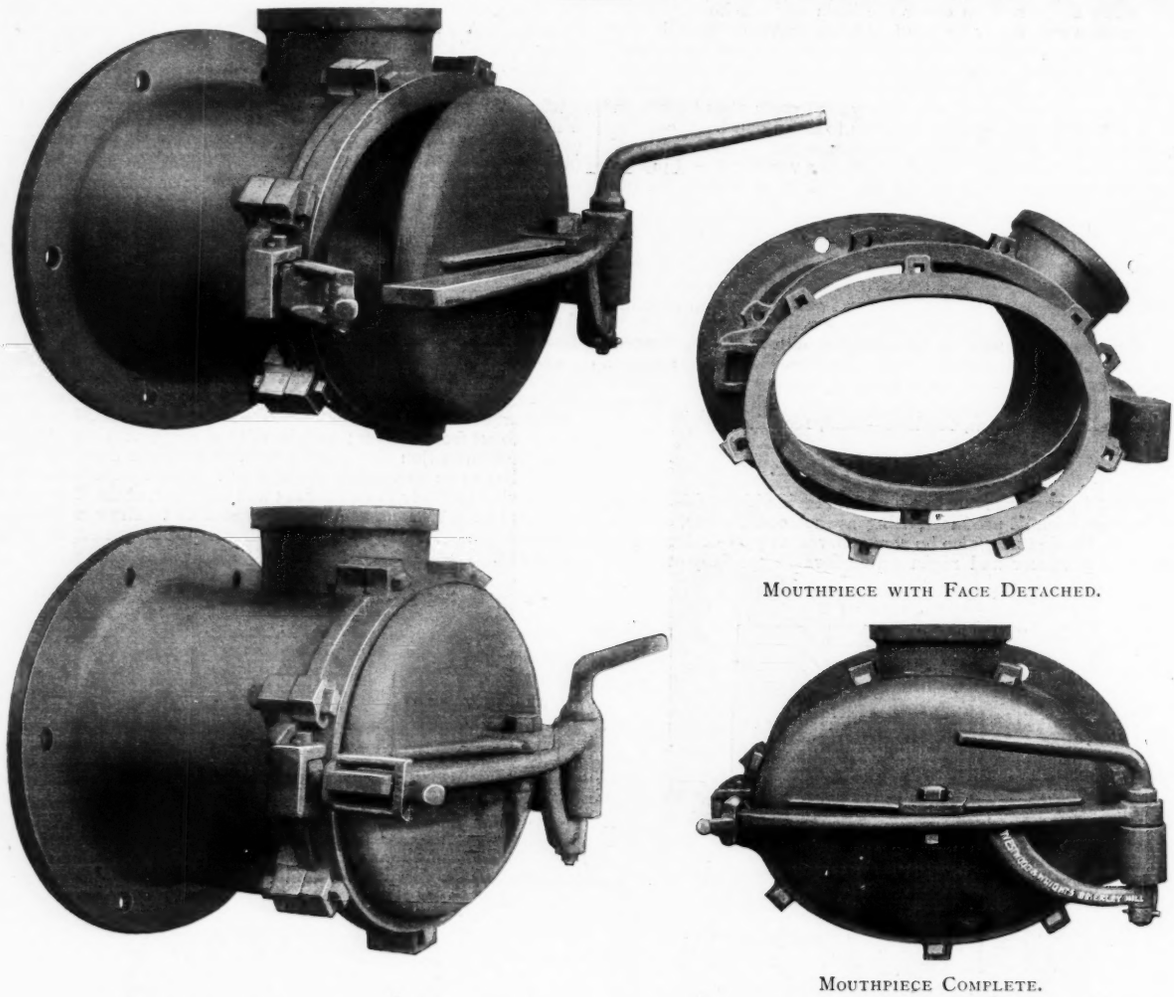
THE HOVINE-BREUILÉ PRODUCER AND ACCESSORY APPARATUS.

A coal producer, using coke and dust, although all right for gas for heating purposes of 900 calories per cubic metre, is unable to produce gas of 1050 or 1200 calories necessary for an average gas-engine with poor gas. If we shut the ash-box and blow dry steam and air at 200° or 300° C. under the grate of this producer, the gas obtained will be good enough for the engine. But if the fuel on the grate-bars is full of ashes, unequal in size, small or powdery, the thickness of the fuel bed will cease to be uniform, passages will be formed, and the gas will be of bad quality. All this is easily remedied when the producer is not being blown, but is impracticable if it is, and under pressure above the grate-bars. It is necessary, therefore, while driving back the gas obtained under 8 to 10 cm. (3¼ to 4 inches) of water, to keep the producer chamber at atmospheric pressure. This is very simply effected by interposing between the producer and the regulating gasholder a suction and blowing ventilator, the working of which is conjoined with the blower under the grate. Thus the clinkering holes can be opened and the producer seen and worked without any escape of gas or inlet of air. A regulating column of coke placed at the back of the producer and traversed by the gas, keeps up a good bed of fuel in case of the attendants' negligence. The purity, size, or character of the fuel is, under such conditions, of little importance, and excellent gas has been obtained from fuel with 65 per cent. of ash. Some fuel, called "refuse of the coke fork," consisting of 17 per cent. of small coke, 25 per cent. of very small coke, 25 per cent. of small dust, and 33 per cent. of fine dust, gave very interesting results as regards the facility with which the producer worked, the regularity of the gas produced, and the low expense per horse-power-hour with such a low-grade fuel. A 75-horse power producer gave effective work of 80-horse power per hour; the gross weight per horse-power-hour being 837 grammes (1·84 lbs.), and the calorific power of the gas 1152 calories. With ordinary coke from the Arras Gas-Works, a producer of 100-horse power gave effective work of 105-horse power per hour, a gross weight of coke per horse power of 600 grammes (1·32 lbs.), and a calorific power of 1120 calories per cubic metre of gas.

The accompanying diagram of the Hovine-Breuillé producer and arrangement will explain itself. It may be added that M. Hovine had hoped to submit this producer for official testing by the Société Technique du Gaz before this year's meeting, but time did not allow, and the trial of it is therefore postponed until next year.

The Papers of Mr. Macfie and Mr. O'Connor at the Royal Scottish Society of Arts.—At a meeting of the Royal Scottish Society of Arts in Edinburgh last week, the reports by various Committees upon papers read during the session were submitted. Messrs. F. G. Bailey, G. R. Hislop, and Thomas Hume reported that they had examined the combination gas governor and meter invented by Mr. Macfie. They thought the invention would be found to be a considerable benefit to consumers. They also reported on two papers by Mr. O'Connor. They said they had examined Mr. O'Connor's method of lighting mantle burners in street-lamps and similar outside lamps, and were of opinion that it was a great improvement over the methods generally adopted. Dealing with Mr. O'Connor's carbonic acid test-pump, the Committee said they were of opinion that the instrument was very well adapted to its purpose—that of taking rapid approximate tests of furnace gases with unskilled operators. All these communications, which have been noticed in our columns, were commended to the favourable consideration of the Prize Committee.

CHANDLER'S PATENT DETACHABLE FACE MOUTHPIECE.



MOUTHPIECE WITH FACE DETACHED.

MOUTHPIECE COMPLETE.

The dogma of the gas profession, reduced to an axiom, has it that "money is made or lost in the retort-house." Of course, this is true. The latest contention, it will be remembered, was waged in the carbonizing department; and, indeed, nine times out of ten the arena of dispute is inside the retort-house.

Any improvement in this department is thus of importance; and we therefore have pleasure in calling attention to the mouthpiece forming the title of this notice. The old-fashioned luted lid served its day, though accompanied by blowing and loss of gas, especially when it was quite the correct thing to work a dip of anything between 3 and 6 inches. The natural and necessary evolution from the luted to the Morton self-sealing lid then became an accomplished and all-but perfect means of shutting off during carbonization. We say "almost perfect," because the machined face, subject, as it is, to wear and tear, as well as accidental injury, necessitated the introduction of the portable machine for refacing, or else the faulty mouthpiece had to be removed to the machine-shop; and, further, though the metal reduction might be anything between $\frac{1}{16}$ and $\frac{3}{8}$ inch, each operation spelled shortening of life so far as the useful function of the mouthpiece was concerned.

This is why we are directing attention to Chandler's patent detachable face mouthpiece, the general construction of which will be understood from the illustrations, almost without a word of explanation. But there is a combination with it which cannot be so easily understood from the illustrations—that is, the Westwood and Wright's automatic fastener, which automatically opens and closes the lid from the action of the handles and cross-bar in operation. As regards the detachable face, when the machined part of the face becomes worn or injured, the detachable part can be easily removed and replaced by an ordinary workman, at very small cost and without unnecessary loss of time. Thus practically the mouthpiece becomes everlasting—at least, so far as it can be so—owing to the removal of the necessity of the destructive process to the life of the mouthpiece under the old conditions of repair.

Gas Calorimetry.

The proposal contained in the report of the Departmental Committee on Gas Testing in the Metropolis that gas should be tested for its calorific power has led a correspondent of "Nature," writing over the initials "G.N.H.," to offer, in the number for the 22nd ult., a few remarks on the apparatus employed in the operation. He says: "Their chief defect is want of portability, and as an alternative a sample of the gas is frequently analyzed, and the calorific value deduced from the results of the analysis. Apart from the difficulty of exactly determining the constituents of such a complicated mixture as coal gas, this method implies that the exact calorific value of each substance present is accurately known, and this, unfortunately, is far from being the case. Most of the data regarding heats of combustion in actual use are derived either from the experiments of Berthelot and his pupils with the calorimetric bomb, or from the experiments of Julius Thomsen; and in the case of gaseous substances the differences between these two experiments may amount to as much as 2 per cent. In the current number of the 'Zeitschrift für physikalische Chemie,' Julius Thomsen has a critical paper on the causes of these differences, and comes to the conclusion that for gases the explosion with compressed oxygen in a bomb gives quite untrustworthy results. His chief argument is based on the comparison of the values obtained for the heats of combustion of homologous series of hydrocarbons and their halogen derivatives; and it is shown that, whereas the method of combustion at ordinary atmospheric pressure gives remarkably constant differences between the consecutive members of such a series, the results obtained by means of the calorimetric bomb lead to differences between consecutive members which are quite irregular. It follows that the values obtained for heats of formation, which lie at the basis of all theoretical speculations in this field, are still more irregular in the case of figures obtained with the bomb, since they are based upon the differences between the heats of combustion. The weak point in most physical work on gases is usually on the chemical side; and on account of the extreme practical and theoretical importance of the subject and the great advances made in the last ten years in the methods of preparation of pure gases, there is still room for a re-determination of these constants. In this connection, it may be pointed out that the ultimate mode of calibration of gas calorimeters of the Junkers type is the combustion of a known quantity of a pure gas the heat of combustion of which is taken as known."

GAS AS A SOURCE OF POWER.

MEMBERS of the New York Section of the Society of Chemical Industry had quite a field day in connection with the above subject at their meeting on March 24 last, when no fewer than four papers were read, in one or other of which every description of commercial power gas was more or less exhaustively dealt with. There is consequently to be found in this series of papers not only the latest, but also a comprehensive expression of American opinion with reference to the application of gas for power purposes.

The first paper, by Mr. Willard L. Case, is entitled "Generation of Producer, Mond, and Blast-Furnace Gases." The author introduces his subject by stating that, upon "blast-furnace and coke-oven gases," and producer gases of which Mond gas is one, more particularly upon producer gas which can be generated and used in any locality, depends the future progress of the gas-engine. This may or may not be. We should have thought that this progress depended quite as much upon the development of the gas-engine as regards size—a matter that is attracting considerable attention at the present time. The author's meaning becomes a little clearer when it is found that he dismisses bench or coal gas, oil gas, and even carburetted water gas as, although all good engine gases, too costly for general use.

In the light of experience in this country in this regard, this seems to be significant of the position of the gas industry on the other side of the Atlantic; and it may possibly be looked upon as one of the penalties which attach themselves to "dollar" gas. At all events, the price at which gas is ordinarily sold in this country has actually helped rather than hindered the development of the gas-engine; and there are very few gas undertakings which do not now derive a material portion of their revenues from this source. From 10 to 20 per cent. of the town supply is commonly absorbed by gas-engines, and much more than this in a few cases. Nor has there hitherto been any indication of a corresponding development of gas-engines driven by any other kind of gas; the town supply, wherever available, being almost invariably preferred. It is quite true that recent indications point to the possibility of a change in this respect; and the question which is now exercising the gas manager is, "At what price must I sell my gas in order to retain my hold on the smaller users of power, and extend my connection among the larger users?" This, apparently, is a form of self-examination which does not trouble the American gas manager; and in the opinion of our author it is the producer-gas process alone which is susceptible of the required development, although for the composition of the gases, he says: "We would have as low a percentage of inert gases and of free hydrogen as possible—the reasons for which are evident—the richer the gas, the less volume there is to be handled and stored; the lower the percentage of hydrogen, the less will be the flame temperature of the mixture, and the slower will be the combustion, which permits of higher degrees of compression and a consequent greater efficiency in the gas-engine cylinder."

Natural gas, having a calorific value of about 1000 B.T.U., is probably the best of all gases for gas-engine purposes, but is restricted to special localities. Producer gas, on the other hand, although nearly at the other end of the scale, with a calorific value of from 144 to 125 B.T.U., can be generated in almost any locality; and while it "is low in energy, it is a very satisfactory engine gas, the presence of considerable quantities of inert constituents having no detrimental effect upon the operation of gas-engines other than occasioning the special designing of ports and passages to accommodate the large quantities of gas used. The efficiency of the various producer gas processes ranges between 70 and 85 per cent.—depending largely upon the design of the producer and its ability in completing the gasification of heavy hydrocarbon distillates. It is the cheapest of all the commercial gases, costing less to generate, requiring the least amount of apparatus auxiliary to the generator, requiring less attendance, and utilizing any available fuel to almost equal advantage—coke, coal, wood, the lignites, peat, and other materials have already been used successfully."

A brief description follows of four distinct methods of operation for the production of producer gas, with all of which readers of the "JOURNAL" are familiar. These are the "pressure" and "suction" methods; the "re-entrant" method, by which the gases are not taken from the top of the producer, but below, about the top of the fuel-bed and half-way down the chamber walls, the object being to gasify the tar vapours within the producer; and the "intermittent" system, which is in reality a method for the production of water gas. It is stated that, whatever the nature of the gas used, an engine of proper design will consume 10,000 to 12,000 B.T.U. per brake horse power per hour at or near full load. With producer gas of 125 B.T.U. per cubic foot—the average value of anthracite gas—the consumption will approximate to 80 cubic feet per brake horse power per hour; and it is evident, from actual demonstration, that a well-equipped gas-power plant, operating on producer gas from any of the coals, should show a duty of at least 1 lb. of coal per indicated horse-power-hour. The stand-by losses of such a plant are very small in a good producer—the consumption of coal during these periods averages about 3 lbs. of coal per hour in plants averaging 250 horse power.

Mond gas is next described: and analyses of it are given. Its advantages are: "The use of a cheap coal and the recovery of a valuable product—ammonia. Its disadvantages are that when arranged to recover ammonia from the coal a great complexity of costly plant, apparatus, and operation is demanded; that when installed without the recovery system, while producing excellent results, it is on the same basis as other systems which employ only one generator—*i.e.*, bituminous coals are not satisfactorily handled, especially if they be of a strongly coking nature." It is further stated that "this system, as installed for power plants under 5000-horse power, does not warrant the installation of the ammonia recovery process." The stand-by losses of a 1000-horse power plant are about 225 lbs. of fuel per night of 14 hours; and when standing for eight days, they are at the rate of about 7½ lbs. per day. After the week-end stoppage, the time required for starting is only three minutes for such a plant. "At the only 'Mond' plant in America, where 150 tons of coal are gasified per day, it was found that the value of the bye-products recovered, after deducting the cost of labour, repairs, and chemicals required, reduced the cost of coal some 50 c. per ton to the plant."

This plant is described in a separate paper by Dr. J. D. Pennock, from which it appears that it is situated at Detroit, and owned by the Solvay Process Company. Dr. Pennock says: "Not all coals are suitable for the Mond producer. First, a bituminous coal low in percentage of bitumen and inferior in coking qualities must be used to avoid clinkering; second, as it is necessary to obtain a high yield of ammonia to effect the extra cost of installation, depreciation, and operation of the bye-products portion of the producer plant, a coal high in percentage of nitrogen must be employed." A coal closely corresponding to that which is used in England with this producer was found in the Hocking Valley coalfields, the Mond gas from which has a net calorific value of 146·6 B.T.U., as compared with 129·7 B.T.U., which is the calorific value of Mond gas made in England. "The yield of ammonia amounts to 70 to 75 lbs. of sulphate per long ton of coal. Tar amounting to 55 to 65 lbs. per ton of coal is also recovered. This is much lighter in gravity than the ordinary coal tar, and has little value except as a fuel, and as such is worth about 1s. per gallon." It may be remarked that this reads like a mistake—1d. per gallon would be much nearer the value of tar as a fuel.

Blast-furnace gases, though of low calorific value (91 B.T.U.), occur in such enormous quantities that they possess a potentiality which has only recently become recognized, and to a certain extent utilized. It was only in 1900 that the first blast-furnace gas-engine of large size (500-horse power) shown in public was exhibited by the Cockerill Company at Paris; while there are now upwards of 300,000-horse power in use and under construction. In America, however, there is but one Steel Company that has made any attempt towards the utilization of blast-furnace gas for power direct. Mr. Moore gives calculations to show the quantity available which are perfectly bewildering, the sum of which is that there is a surplus over and above all the requirements of the blast-furnace itself, amounting to 25-horse power per hour for every ton of pig iron produced per day. So that the total amount of available power lost in the waste of this gas amounts (according to reliable authority) to from 1½ to 2 millions horse power per hour. It must be said, however, that this availability depends not only upon the practicability of satisfactorily cleaning the gas and freeing it from dust so as to make it fit for use, but also upon securing with a reasonable degree of certainty the continuity of its supply. Thus "no group of less than three blast-furnaces can be considered as sufficient to supply a power plant which is intended to produce power for the general market; for in any group of furnaces at least one will at some time be out of blast for relining, and another may be stopped because of a shortage of raw materials, trade or labour conditions, accidents or trouble in operation, or for other causes."

The "Utilization of Gas for Suction Producers" is briefly dealt with by Dr. Oskar Nagel, who states that this type of producer is especially to be recommended for units up to 250-horse power. The utilization of fuel in suction producers is stated to reach 80 per cent. or more. He says:

> Anthracite, charcoal, or coke can be used equally as well for generating gas in a suction gas-producer. It will take, according to the ash content, 1 lb. to 1¼ lbs. of anthracite or charcoal, or 1¼ to 1½ lbs. of coke for developing 1-horse power per hour. With anthracite (pea) at $5 per ton, 1-horse power, however, will cost about ¼ c. This is about one-eighth the cost of illuminating gas at a price of 75 c. per 1000 cubic feet, or one-eighth the cost of gasoline power, figuring gasoline at 16 c. per gallon. An ordinary illuminating gas-engine has to undergo some slight changes before it can be used for producer gas. The compression has to be increased to at least 105 lbs. and the ratio of gas to air has to be arranged 1 : 1¼. The gas-inlet has to be increased, and the air-inlet decreased, to the ratio named.

Not the least interesting portions of these papers are the references to coke-oven gas, which is already playing a not unimportant part in this connection. The idea of employing recovery coke-ovens as a part of the plant of a gas-works has long been entertained in this country—in fact, ever since Mr. Charles Hunt read his paper entitled "Notes on Residuals," at the meeting of the Institution of Gas Engineers in 1896. But it has existed here only as an idea, whereas in America it has assumed very practical form. In addition to the Everett plant—consisting of 400 Otto-Hoffman ovens, which supply illuminating gas to the City of Boston—there is a plant of 40 Semet-Solvay ovens at Chester, Pa., from which 900,000 cubic feet of enriched gas of

18-candle power per day were delivered during 1904 to the Chester Gas Company, for distribution for illuminating, gas-engine, and fuel purposes; while at Detroit and Milwaukee there were delivered to the Gas Companies of these cities, also from Semet-Solvay ovens—120 at the former and 80 at the latter—gas of about 675 B.T.U. (gross), and of 19 to 21 candles illuminating power, at the rate of 2,700,000 and 1,900,000 cubic feet per day. The quality of gas mentioned suggests that low-grade gas has not yet come into vogue in the United States.

Mr. C. G. Atwater commences his paper on "Coke-Oven Gas" by pointing out that the production of gas in coke-ovens is exactly analogous to the distillation of coal in the ordinary gas-retort, as proved by typical analyses relating to the two processes. He compares the cost per million B.T.U., when obtained from gas at $1 per 1000 cubic feet, or from coal at $3 per ton (2000 lbs.); the former working out at $1·54, and the latter at only 8·6 c. It is, however, admitted that this great discrepancy in cost is reconciled to some extent by the greater efficiency of the gas-engine, and also by the cost of coal-handling and labour in the boiler-house. But it is assumed, not only that illuminating gas at $1 per 1000 cubic feet has not a wide field as a source of power, but also that at a cost of (say) one-fourth or one-fifth the value assumed above, it would become a prominent factor. This must be regarded as an extreme view, since not only is 1s. per 1000 cubic feet, speaking generally, an impossibility at the present time, but a substantially higher figure does not by any means put illuminating gas out of the running in competition with producer gas.

It seems to be the practice in the management of recovery coke-ovens to separate the first or most valuable portion of the gas for illuminating or power purposes; reserving the remainder to heat the coking-ovens. From 3000 to 4000 cubic feet per ton of the richest gas is thus disposed of, having a calorific value of 650 to 700 B.T.U.; the power gas amounting to 5000 to 6000 cubic feet per ton, having a calorific value of 500 to 600 B.T.U.

The present condition of the coke-making industry in the United States relative to gas production is thus stated: For the year 1903, the production of coke was approximately 25¼ million tons, of which 7·4 per cent., or a little over 1¾ million tons, was produced in bye-product ovens; the balance, or 23⅓ million tons, being produced in ovens of the beehive type. Assuming the ratio of coke yield given by the United States Geological Survey, which is 64 per cent., this would represent, in round numbers, 38·8 million tons of coal carbonized without recovery of bye-products or gas, with the exception of certain plants, which obtained a small amount of steam by passing the waste heat from the beehive ovens through boilers. The carbonization of this coal in bye-product ovens would have yielded, on the average, 3500 cubic feet of surplus gas, besides that needed for heating the ovens. At 600 B.T.U. per cubic foot, and allowing 12,000 B.T.U. per horse power per hour, this would have been equivalent to 175 horse-power-hour per ton of coal, or 283,000,000 horse power exerted continuously throughout the year.

For use in gas-engines, it is not considered necessary to purify from sulphur the gas obtained from a coal of good quality; it being found that in such gas the sulphur present is not above the limits that can really be safely used in the engine cylinders. Dr. Pennock quotes in his paper his experience at Syracuse for several years with a 125-horse power Westinghouse engine developing 85-brake horse power (90 lbs. pressure) on coke-oven gas of 450 B.T.U. net (28 cubic feet of gas per brake horse power), made from a coal containing 1·1 per cent.; this being that no serious corrosion has taken place due to sulphuretted hydrogen or sulphuric acid, while of twenty-two gas-engine installations in Germany, of a total of 13,000-horse power, working in coke-oven gas, eleven, or 50 per cent., do not need to purify the gas.

Stress is laid by the writers on the desirability of a low percentage of hydrogen for the avoidance of pre-ignition. On this point, Dr. Pennock remarks that "if pre-ignition is chargeable to high percentage of hydrogen, coke-oven gas is no more liable to pre-ignition than Mond producer or ordinary producer gas. Unquestionably, we must consider the percentage of hydrogen in the explosive mixture." He proceeds to show by a table that the coke-oven gas, when mixed with the amount of air which gives the maximum efficiency in the engine, contains less hydrogen than the proper mixture of producer gas and air, and instances cases where trouble from pre-ignition had been overcome by varying the compression of the engine in inverse proportion to the value of the gas mixture. He states, in conclusion, his belief that coke-oven gas is "the power gas of the future, in places where it is impossible to get blast-furnace gas or natural gas."

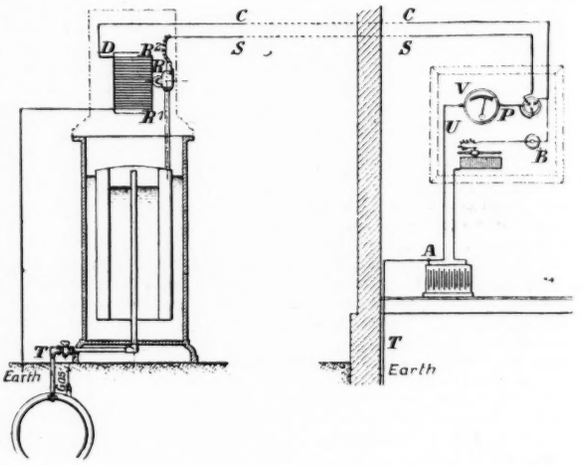
Artificial Fertilizers.—In last week's issue, we referred to certain reports from abroad on the use of artificial fertilizers. In his report on the trade of Java for 1904, H.M. Consul at Batavia (Mr. D. D. Fraser) states that the demand for nitrogenous manures has shown a steady increase during recent years, due to a certain extent to their liberal use for the cane crops of the island. Sulphate of ammonia and ground nut cake are the most important manures imported into Java—the former comes chiefly from the United Kingdom and the Netherlands; and the latter from the Coromandel Coast. H.M. Consul at Stockholm also reports that the import of fertilizers has much increased in Sweden during the last ten years; and as far as can be calculated, it ought to continue, for farmers are only now beginning to realize the benefits to be derived from such aids to agriculture.

INDICATION AND REGULATION OF GAS PRESSURE AT A DISTANCE.

As briefly mentioned last week, two papers dealing with the above subjects came before the members of the Société Technique at the recent congress. The authors were M. Crozet and M. Frère. We give below the principal portions of the first-named communication; reserving M. Frère's till next week. Both are most interesting.

M. Crozet, in drawing attention to the usefulness of an apparatus for accurately indicating pressure in a distant part of the service, described the arrangement adopted by the Compagnie Continentale pour la Fabrication des Compteurs. It is an installation based on the simultaneous use of two well-known pieces of apparatus—viz., the pressure indicator used as a transmitter, and the voltmeter used as a receiver. The apparatus consists of the following parts: (1) A pressure-gauge placed in the distributing system, (2) an electric circuit with two conductors, and (3) a voltmeter and pile battery in the works.

The pressure-gauge used is of the portable type; but the registering drum is replaced by a cylinder on which is a white metal thread forming an electric resistance. The rod of the bell of the indicator carries on its upper end a hood with two binding screws for an electrical connection, and a roller working on the above resistance. The latter is traversed by a roller which makes electrical contact, and brings into the circuit a greater or less number of helices. The electrical connections forming two circuits—that of the piles which on one side are in contact



Crozet's Apparatus for Indicating Pressure at a Distance.

with the earth circuit T A B C D T (the resistance of the indicator is connected on one side to the battery and on the other to the earth), and a secondary circuit R S P V U A, which encloses the voltmeter. The latter indicates the voltage between the points R and A. Corresponding to the pressure in the town mains, the bell of the indicator will be at a greater or less height, and the contact roller will displace the point R accordingly. When the roller is at R^1, the voltage is at its lowest point; when at R^2, at its highest. All the helices having the same length, the indications of the voltmeter are proportional to the number of helices taken in, and hence to the height of the bell and to the pressure in the town.

Under these conditions, it is sufficient to graduate the voltmeter, by comparison in millimetres of pressure, in order to be able to read off the pressure in the town. This principle presupposes a constant voltage from the battery; and in order to avoid any great variation, the circuit T A B C D T is broken by B, which is simply the press-button of an electric bell. When it is desired to make a reading on the voltmeter, this button is pressed. Hence the circuit is made only during the readings, and thus the voltage varies extremely little. Nevertheless, at the end of a definite time there will be a certain amount of variation; and therefore there is introduced in series with the pile battery a resistence, which, by regulation, permits of the voltage in the circuit remaining constant. The verification of the constancy of the voltage and the manipulation of the resistance are made according to the readings of the voltmeter. The commutator permits of the voltmeter circuit being closed in order to read the voltage of the piles. This arrangement admits of very great accuracy, and might be used for other purposes, such as the investigation of the conditions of the flow of gas in a pipe. If, for example, the resistance is three helices per millimetre of height, and if the indicator is such that the bell rises 4 mm. for 1 mm. difference of pressure, this conjunction will enable measurements of 1-12th of a millimetre to be easily made. The indicator can be fitted with an ordinary pressure-recording drum.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

Annual Meeting at Hastings.

The water-works engineers of the country, while they find ease of mind in copious rains, do not appreciate them while from home on business or pleasure intent. It was in the midst of a heavy downpour that the members of the British Association of Water-Works Engineers proceeded to the Town Hall, at Hastings, on Thursday morning last for the opening of their tenth annual meeting. But rain had no effect on the gathering. Members assembled in the Council Chamber in numbers equal to, if not greater than, the best of previous similar occasions. Promptly to the appointed time, the Mayor (Mr. Charles Eaton), the Deputy-Mayor and Chairman of the Water-Works Committee (Alderman B. H. W. Tree, J.P.), the Town Clerk (Mr. Ben F. Meadows), together with several members of the Corporation, filed into the chamber to bid the members welcome; and this was the beginning of most generous hospitality on the part of the Corporation, whose Engineer—Borough and Water—the incoming President (Mr. P. H. Palmer, M.Inst.C.E.) is.

The Welcome.

His Worship said a very pleasant duty was imposed upon him that morning, as the representative of the Municipality of Hastings. Speaking on their behalf and in their name, he extended to the members a very cordial welcome to the town. The Corporation were exceedingly glad that the Association had chosen Hastings for their annual session; and they were proud to see so many distinguished individuals spending two or three days in their midst. He trusted the meetings would be of a pleasant character. According to the programme, business and pleasure were so interwoven that, given good weather, he was sure his hope would be realized.

The President (Mr. F. J. Bancroft, of Hull) asked the members to accord the Mayor a very hearty vote of thanks for the cordial reception he had given them that morning. They were indeed pleased to come and meet in the beautiful town of Hastings. It was good of the Mayor and Corporation to place the Council Chamber at the disposal of the Association, and to welcome the members in such a hearty fashion.

The proposal was endorsed with loud applause.

His Worship, in reply, remarked that he would be pleased to convey the resolution to his colleagues on the Council, who would reciprocate very heartily the good feelings the members of the Association had displayed towards them.

The Mayor and his colleagues having vacated the platform, the President took the chair, being supported by the President-Elect (Mr. P. H. Palmer, M.Inst.C.E.), the Secretary (Mr. Percy Griffith), and most of the members of the Council.

Minutes of Last Meeting.

The Secretary first read the minutes of the ninth annual winter meeting held in London on Dec. 10 last; and they were unanimously confirmed.

The Retiring and New Presidents.

Mr. Bancroft said the time had come for him to give up the presidential chair; and he did so with pleasure, not unmixed with regret—regret, because a very happy year of his life had passed, and pleasure (he might say, deep pleasure) because of the choice the members had made in the President to succeed him. There was no one whose accession to the presidential chair had given him, or would give him, greater pleasure than that of Mr. Palmer, who had won their esteem by his hearty efforts in favour of the Association. Addressing Mr. Palmer, he said: You have been chosen, Sir, by the unanimous vote of your colleagues to the presidency of this Association. I sincerely congratulate you, and hope you may have good health and strength during the year to preside over us, so that the Association, whose welfare you have so much at heart, may have a year, under your guidance, of continued prosperity and success.

The President (Mr. Palmer), on taking the chair, had an enthusiastic reception. He thanked the members sincerely for the honour they had done him in electing him their President. He would, he said, have pleasure in doing all he possibly could for the benefit of the Association; and it would be his endeavour to follow in the footsteps of the Presidents who had preceded him.

Thanks to the Outgoing President.

The President said he had next a pleasant duty to perform, and that was to propose a hearty vote of thanks to the retiring President. During Mr. Bancroft's year of office, the Association had progressed he thought equally as well as, or better than, during the term of any of his predecessors. The meeting at Hull was a particularly good one; and Mr. Bancroft set them the example (he did not altogether know whether it ought to be followed every year) of taking a trip abroad. However, that trip was most successful. Everyone, he believed, enjoyed it; and he was quite sure that it was the means of imparting a considerable amount of knowledge to all the members who took part in it. His own opinion was that, by going about not only in this country but abroad, there was a great deal that was instructive to be seen by inspecting the works of others. The Association, he was sure, would pass a very hearty vote of thanks to Mr. Bancroft. He was glad to hear from him that his year of office had been a pleasant one; and he was certain that Mr. Bancroft, as the immediate Past-President, would do all he possibly could to support him (the President) during his year.

Mr. W. Matthews (Southampton) seconded the motion. He remarked that the President had spoken of what might be called the public work Mr. Bancroft had done; but he (Mr. Matthews) would like to add that the way in which Mr. Bancroft had presided over their private meetings as the chief of the Council, the courtesy and the great amount of tact he had shown when questions of perhaps some little difficulty had arisen among them, had won their entire admiration. A President had a great deal to do with the inner working of the Association, as well as with the work which they saw him publicly perform. In his (Mr. Matthews's) judgment, Mr. Bancroft had been a most exemplary President.

The motion was carried with applause.

Mr. Bancroft said he highly appreciated the honour which the members did him when last year they elected him to be their President; and he also much appreciated their vote of thanks that day. His year of office had been a pleasant and happy one. The President, however, could do little by himself, unless he was supported by a hard-working Vice-President and a loyal Council, and the general body of members giving their President the utmost assistance. He should always look back with great pride on his year of office; and he might add how proud he was of their volume of transactions for the year. The book had cost about £200; so that the members who were unable to attend the meetings had a very handsome return for their subscriptions.

The President then delivered his

Inaugural Address.

In the introductory part, the President thanked the members for having elected him to the highest office, and for holding their summer meeting in Hastings. He then referred with satisfaction to the position of the Association, mentioning that they now possessed a total membership of 305—Honorary members, 2; Members, 200; Associates, Class A, 73; Associates, Class B, 30. He directed attention to the success of the meeting in Hull last year, and to the instructive visit to Belgium, and followed with a passing allusion to the financial position of the Association, which is a thoroughly sound one. The accumulated funds at the end of last year amounted to £448, of which £272 was represented by cash in hand and on deposit. Another matter of domestic importance to which he referred was that the Council, during the year, have revised the bye-laws for the approval of the members. The suggested alterations and amendments, he said, have been carefully considered with a view to bringing the various sections into line with those in vogue in the Institution of Civil Engineers and other older associations. It is proposed to augment the number of honorary members, so as to include men who are not of English birth or nationality, but who are engaged in or upon one of the several branches of water engineering. Great progress, too, has been made during the year in the standardization of cast-iron pipes, and of regulations as to water-fittings.

From the succeeding parts of the address, the following extracts are made: The practice of water engineering is becoming daily more technical and complicated, and deals with the important subjects of rainfall—the obtaining of accurate data being the prime factor in ascertaining the supply available from a given drainage area—geological considerations, losses by evaporation, discharge by floods, the regulation of fittings, the quality of different kinds of water, and their suitability for domestic or industrial purposes, filtration of water, design of works generally, pumping plant, working of meters, and a general knowledge of mechanical work. I think, perhaps, the most valuable advances made in recent years have been in regard to the more perfect filtration of water; and in America and elsewhere, the growing use of reinforced concrete in water-works design.

We have from time to time to face epidemics of typhoid fever, due to impurities in drinking water; and it seems difficult to realize that, with the pitch of perfection to which bacterial analysis has reached, and the effect of careful and thorough filtration, the bacilli should not be detected until the typhoid has actually got a firm hold. I think that there are few cases where epidemics have taken place due to polluted drinking water in recent years which could not have been largely prevented by daily or bi-daily analysis of the water, and filters of such adequate area that a change-over could be frequently made. As typhoid is always epidemic in some part of the country, it is of the highest importance to prevent its organisms getting into the water; and it is gratifying to see that both urban and rural districts are striving to accomplish this object. It is principally to the bacteriological examination of water that we must look for assistance, although the importance of chemical analysis in the detection of sewage contamination cannot be over-estimated. Large quantities of water are often available which are contaminated to a slight extent, but which might, with proper filtration and constant analysis, be used with perfect safety. In view of the increasing demands made by the growth of population, further legislation to prevent the pollution of rivers and a much

more rigid supervision than has been exercised under the Rivers Pollutions Prevention Act are obviously urgently required.

It is, in my opinion, desirable and necessary that all waters supplied to the public by water undertakings should be analyzed by a fully-qualified chemist much more often than is generally the case at present, and that in many cases a chemist should be engaged to test samples both chemically and bacteriologically, which should be taken daily, and oftener in hot weather. There are many water supplies, particularly in Germany and America, taken from rivers distinctly polluted by the drainage of large towns, which, after proper filtration, are classed as wholesome waters—being bright, odourless, with but little trace of organic matter, and entirely free from organisms derived from sewage or manure.

The use of mechanical or pressure filters, either as the only means of filtration, or as roughing filters in combination with open or covered sand filters, is worthy of closer investigation on the part of water engineers. They are used somewhat extensively in America, and might, I think, be usefully employed for filtering and improving the colour of peaty water and waters charged with iron.

The subject of filtration is one which has made rapid strides: and it now enables us to remove from 90 to 98 per cent. of the bacteria present. The rules in use by the German Government stipulate that a satisfactory filtration will never yield an effluent with more than 100 bacteria per cubic centimetre; and to allow a complete and constant control of the bacterial efficiency of filtration, the filtrate from each single filter must be examined daily. Any sudden increase in the number of bacteria should cause a suspicion of some unusual disturbance in the filter, and should make the superintendent more attentive to possible causes.

The study of geology cannot be over-rated, and is of inestimable value to the water engineer—in fact, without a sound knowledge of geology, there would be no alternative but to rely upon the "dowser and water finder." Although I have absolutely no faith in the "dowser" myself, I have known instances where he has been very successful, and others where he has been entirely wrong; but he frequently works on the "no success no pay" plan, which often finds favour with public bodies as well as with individuals. A great deal might be said upon this subject; but I think it will be found that nearly always where the dowser is successful, a knowledge of the geology of the particular district would have secured equally reliable results as regards determining the presence of underground water. On the other hand, two well-known cases where the "diviner" has succeeded after failure on the part of the best geological and engineering advice may be cited. The first was at Horsham, where, after £1000 had been spent in fruitless sinkings and borings, Mr. Mullins was called in, and quickly pointed out two places where an abundant supply of water would be found within a moderate depth; and his predictions were fully verified. The second case was at Waterford, where various wells and borings had been made; one boring being 1000 feet deep. Not far from this boring, Mullins found what he termed a line of copious flow, and fixed on a spot as being the one to sink at—asserting that, at a depth of from 80 to 90 feet a large flow would be found. A boring was made; and at a depth of 81 feet a yield of 2000 gallons an hour was found, which has remained practically constant ever since. There may be other cases quite as striking, but I think the general impression may be accepted that the water dowser is not to be relied upon, although I admit that many strong arguments may be brought forward in his favour.

The law of underground water as it stands to-day is so unsatistory that some reform is really needed. It was originally settled in the year 1859 by a decision in the House of Lords on an arbitrator's award in the case of *Chasemore and Richards v. The Croydon Corporation*. Until the Legislature takes some control over underground water areas, difficulties will arise between neighbouring towns where water has to be derived from underground sources.

This difficulty leads me to make some remarks upon the consumption and waste of water, and to venture the opinion that at least one-fifth of the water supplied to the consumer in this country is wasted. The amount of water necessary to supply all the wants of a given population is calculated upon the basis of the theoretical requirements of each person, *plus* the estimated quantity required for municipal and manufacturing purposes. The results will, of course, vary within very wide limits; but I see no reason why for domestic and municipal purposes 10 gallons and 5 gallons respectively should not be ample, and for manufacturing purposes from 3 to 10 gallons per head of the population. The supply, however, varies so enormously between different towns, that one is inclined to believe that this difference depends more upon the amount wasted than upon the amount used for domestic, municipal, or trade purposes.

Few persons realize the immense amount of water which is wasted in almost every town; and as waste of any sort is bad, I often wonder why it is allowed to proceed. Of course I am aware that the prevention of waste can only be accomplished by the expenditure of money in installing waste-detecting meters and a thorough and adequate inspection of fittings; and in this respect nothing but thoroughly sound plumbing and fittings should be allowed. Whether from a monetary point of view, it is more economical to allow waste to continue or to control it, depends upon many and varied circumstances. I venture, however, to think that, in most cases, it is cheaper and desirable to reduce waste to its lowest possible point.

In Hastings waste-water meters have been installed, and frequent and thorough inspection of fittings is made, with the result that the consumption per head of the population is not more than 20 gallons for all purposes. Every house in the town is fitted with one water-closet, many with two and upwards, and nearly two-thirds of them with baths.

By the careful study of the requirements of a community, the amount of water which must be supplied daily may be estimated with a fair approach to accuracy; and while every care is taken to avoid waste, it is impossible to entirely prevent it, and it is advisable to provide a supply considerably in excess of the requirements, so as to meet all contingencies.

A question that affects in an important degree the management of water-works is that of the sale of water by measure. In the case of power or industrial purposes, it appears to be generally accepted that the sale of water by measure is the most just and convenient way of gathering revenue from customers. But in the case of domestic supply in this country, it is otherwise. Sale by measure for domestic supply is not at all uncommon in Germany. But I venture to think that, from a sanitary point of view, it is not desirable; and the difficulties inseparable from attempts to measure with accuracy domestic water supplies, have not been entirely overcome. Further, even if the approximation to truth given by some water-meters were considered satisfactory, the cost of introduciug such a system into large towns in this country would be prohibitive.

I should like to call attention to the somewhat unsatisfactory use of water-meters; and the difficulty of obtaining meters to register a dribble or small flow. It is, of course, known that water-meters are divided into the following classes: (1) Low-pressure meters. (2) Inferential meters. (3) Positive meters. (4) Meters of the Venturi class. (5) Waste-detection meters of the Deacon class. Each of these classes has a useful purpose which it is capable of answering with more or less advantage, according to its individual merits. The mistake often made is that meters are used indiscriminately, and frequently selected on account of first cost, without due regard to the duty to be performed. The registration of small flows is of great importance; and I have repeatedly found inferential meters failing altogether to register small flows, and others to register an amount far below the truth.

It is admitted that something like 10 gallons per head per day of the London water supply represents waste. This quantity, based upon a population of 5 millions, is 50 million gallons a day, or sufficient to supply 25 gallons per head to an increased population of 2 millions, and is nearly as much as the total amount supplied to the City of Berlin.

Low-pressure meters, in which the whole of the pressure from the main is lost in passing through them, are not suitable for general use, but only for measuring small flows, such as supplies to flushing cisterns. With inferential meters (as the name implies), the water is not actually measured; but the quantity that passes through them is inferred from the number of revolutions made by the fan or turbine, which is the only moving part. These meters are convenient, as they are comparatively small, light, and cheap, and are fairly accurate when the water passes through at a good speed. When, however, the flow is slow, their registration is unsatisfactory, as the fan or turbine then lags or stops entirely, while the water passes through freely. Positive meters, as the name implies, aim at measuring accurately or positively, and record the water actually passing through them. They have one or more cylinders, which are alternately filled and emptied, and fitted with suitable counters. The Venturi meter has no moving parts, except the registering gear driven by clockwork. It is suited for measuring large volumes of water, and is very accurate for ordinary rates of flow in water-mains. Waste-detection meters are used generally for locating leakages and waste from street mains. The selection of a suitable meter depends on varying circumstances; but, generally speaking, a positive meter is to be preferred to the inferential where anything like accuracy is desired.

I do not propose to offer any remarks upon the construction or works of water supply beyond drawing the attention of the members to the great possibilities and the advantages of reinforced concrete in structures such as service reservoirs, conduits, and works of a similar nature. In this country, structures of reinforced concrete design are comparatively scarce, probably owing in some measure to the difficulty of obtaining loans for any reasonable period with the sanction of the Local Government Board. In Germany, France, and America reinforced concrete structures are very common; and the Government Departments of these countries have drawn up proper and suitable regulations in respect to its use. Large conduits, reservoirs, tanks, and even dams, are being constructed with perfect safety; and, as reinforced structures require the very best of materials in building, it necessitates a thorough knowledge of cements and concrete and strains. The strength of "reinforced" concrete is certainly three or four times as great as it would be without the reinforcing material.

Moved by Mr. F. Griffith (Leicester), and seconded by Mr. Easton Devonshire, a hearty vote of thanks was passed to the President for his address.

The President, in reply, said he was much obliged for the vote of thanks. The address was not altogether what he could have

wished it to be. The difficulty in preparing an address was to put one's thoughts in as small a compass as possible. This he had tried to do; but he had left out much that he should have liked to put in.

Elections.

Nominated by the President, Messrs. T. W. A. Hayward and Easton Devonshire were elected Hon. Auditors for the ensuing year.

The Scrutineers reported that, as the result of the ballot, all the candidates for membership had been elected, as follows:—

Members.—Mr. F. J. Garland, of Broxbourne, Herts; Mr. C. F. Gettings, of Teignmouth; Mr. W. I'Anson, of Saltburn-by-the Sea; Mr. W. M. Langford, of Roumania; Mr. S. R. Lowcock, of Westminster; Mr. J. H. Secker, of Slough; Mr. W. O. Thorp, of Malvern; Mr. L. C. Walker, of Reading; Mr. F. P. Whiteside, of Bath.

Associates.—Mr. L. Askew, of Westminster; Mr. S. R. Bate, of Penistone; Mr. J. F. Bedford, of Leeds; Mr. S. P. Bland, of Hythe, Kent; Mr. G. Claxton, of King's Lynn; Mr. W. G. Cross, of Tunbridge Wells; Mr. J. F. Hartlieb, of London; Mr. C. Horobin, of Ipswich; Mr. A. H. Jameson, of Bamford; Mr. J. Kennedy, of London; Mr. A. C. Potter, of London; Mr. W. I. Tait, of Nuneaton; Mr. T. Waddingham, of Baildon.

It was also reported that Mr. R. S. Lloyd had been transferred from the class of Associates B to the class of Members.

This concluded the first morning's sitting.

The Mayor's Luncheon.

With great generosity, his Worship the Mayor entertained the members at luncheon at the Albany Hotel. It was served in luxurious style. A large number of the members of the Corporation were also present; and among the guests were observed Dr. Gray, the Chairman of the Gas Company, and Messrs. C. E. & C. F. Botley, the Engineer and Assistant-Engineer.

After the loyal toast,

Dr. Gray gave "Prosperity to the British Association of Water-Works Engineers." He remarked that it was not many days before that he was called upon to propose a somewhat similar toast at another body of engineers with interests similar to his own. As a total abstainer, and one with an absolutely impartial mind, he felt he could confidently say that there was nothing of greater general importance, after gas, than water. (Laughter.) He said with some confidence that the members could not have selected a better place to visit than Hastings on the occasion of their annual meeting; and, after many years' knowledge of their President, they would all pardon him if he said they would have had considerable difficulty in selecting a gentleman more competent and better able to fill the position of President. As a member of the Water Committee, he hoped that, when they visited the Hastings new water-works, they would find them a credit to all concerned, and especially to the one on whom had fallen the labour and the mental work connected with the scheme.

The toast having been honoured,

The President, on his own behalf and that of the members, thanked Dr. Gray for the kind words and sentiments he had expressed, and which had been so heartily endorsed. The Association, he said, was now ten years old; and had during that period more than met the expectations of the promoters. The increase in membership was very satisfactory; and the Association was in a very healthy and prosperous state generally. He gave information as to the objects of the Association; and, in doing so, strongly urged that members of corporations should go and visit other places to see what was being done there, and even the Hastings Corporation would find that everything that was done well was not done in Hastings. There was a great deal to be learnt by going to see what others were doing.

Alderman Francomb (Warrington) gave the toast of the Mayor, and, in doing so, thanked him most sincerely, on behalf of all present, for his hospitality. In the course of his remarks, the Alderman mentioned that he had been Chairman of the Warrington Corporation Water Committee ever since the works were purchased by the Corporation fifteen years ago; and they had just finished a scheme which had given them 4 million gallons of water a day. In this work, they had had the services of their respected Engineer (Mr. James Deas).

His Worship made an appropriate and humorous reply; and this ended one of the most delightful of the many enjoyable features of the programme.

Reading of Papers.

The proceedings were resumed in the afternoon; and the whole of the sitting, and a large portion of the next morning (Friday), were engaged in reading and discussing the following papers:—

"The Relationship between Capital, Working Expenses, Revenue, &c., of Water-Works Undertakings." By G. O. H. Klopp.

"Extensions at the Wallasey Water-Works." By J. H. Crowther.

"Steel and Concrete Construction at the Antwerp Water-Works." By Easton Devonshire, Assoc.M.Inst.C.E.

The papers by Mr. Klopp and Mr. Devonshire evoked considerable discussions; but that by Mr. Crowther (the author being absent at the time) was read by the Secretary, and did not produce any comment. Abstract reports will appear in future issues.

Oxidation and Corrosion.

In the evening (Thursday), the members reassembled in the Council Chamber to hear a lecture by Mr. H. F. Cheshire, F.I.C., B.Sc., on "Oxidation and Corrosion," which is a subject with which engineers of all branches are concerned. The lecture was delivered extempore, and step by step the lecturer led up to his conclusions by experimental illustration before the members.

The President, in introducing Mr. Cheshire, said the subject was one that was particularly opportune, especially from the fact that at Hastings they had a water which gave much trouble from corrosion. The water was very largely impregnated with oxide of iron, both in suspension and solution; and a nasty coating formed on the surface of the pipes, which caused a great deal of trouble, and was difficult to deal with.

The lecture was of considerable length; and we can only epitomize the points here.

Mr. Cheshire, in the course of the lecture, said: I shall deal with my subject in a simple way, and more especially as regards principles than facts. After all, the scientific principles are the important part of subjects of this kind. Oxidation and corrosion are so very similar, and so very closely interwoven with one another, that it is extremely difficult to make a dividing line. One gets corrosion which is evidently oxidation, and one gets corrosion by acids which, after all, is a form of oxidation, and in most cases requires oxygen for it to be brought about. For the ordinary rusting of iron, carbonic acid, oxygen, and moisture are all necessary. If carbonate of soda is added to a solution of iron in which the iron is fully oxidized to the ferric condition, we get brisk effervescence, because the soda takes the acid from the iron; but the iron will not take the carbonic acid in exchange in the usual way. In the rusting process then, the iron encouraged, as it were, by the carbonic acid and water takes up the oxygen (with perhaps a momentary production of ferrous carbonate) to become first the black rust, and then the red ferric rust. Even excess of carbonic acid in water favours the corrosion of iron or steel.

It is a well-known principle that mixing metals is likely to cause trouble in this direction, or protection of one metal at the expense of another. For instance, we must not fasten copper sheeting with iron nails. The galvanizing of iron is on this principle; the zinc protects the iron at its own expense; and as long as any zinc remains, the iron will not corrode. This is evidently due to electrical action. If I place a strip of steel in dilute acid, it shows some signs of solution with a slight effervescence from its surface. Now put in a strip of copper in contact; and the effervescence much increases, but from the surface of the copper—whether the two metals touch under the surface of the liquid or above by means of a wire. Experiment, however, shows that it is the iron which is dissolving, and much more quickly in contact with the copper. The zinc gives similar results to the iron, but is more active. Now let us try zinc and iron; and we get the effervescence from the iron—the zinc is dissolving, and the iron is protected. In tinned iron vessels, if the joints be well made, the tin tarnishes; but if there be bad joints so as to expose the iron, the iron rusts rapidly, and the tin remains bright.

Electric tension is present everywhere, and has been too much overlooked. The mere passing of one substance over another, the contact of two dissimilar substances, especially metals, and even the evaporation of water, all produce electric tension in greater or less degree. Our zinc has now finished dissolving; and what do we find? A lot of black bits floating about. Carbonaceous matter, you say, from the coal used in the smelting, and some sulphide of lead. But carbon is used as a positive pole in electric batteries; and here it has been bringing about the violent solution you have witnessed. This second sample of zinc has been purified for analytical purposes; but the difficulty is to get it to dissolve. We have to add copper or platinum to take the place of the removed carbon, and supply the necessary electric couple. I believe that electrical action is involved in all the slower changes we have to deal with, if not the more rapid ones as well.

Now let us consider, in this light, the phenomenon of pitting. Iron or steel is prepared for use by the removal of certain impurities, and sometimes the addition of others, as carbon in steel. The mixing is not complete. Two liquids at ordinary temperatures are easily mixed with a stirrer; but with viscid masses of molten metal, it is a very different matter, even disregarding the formation of different combinations as the carbides of iron which may even crystallize out. In this way, one part of your metal plate is slightly more positive than another; and it is not a question of its dissolving rather less quickly than another more negative part, but of its protection at the expense of the other. In a steel boiler you have high temperature and high pressure both favouring oxidation, and, of course, time is given. One plate may remain sound, while another pits, because it is slightly more positive; but if it were removed to another boiler, where the plates were more positive still, it would then be the victim. I am inclined to think that the near future will see more attention to homogeneity of metals. It is want of homogeneity that encourages corrosion, if it is not an absolutely necessary condition.

The character of the water is also an important factor. Chlorides and other salts are masked acids which are rendered active by electrical action (salt is used for acids in some electric batteries); iron in solution, being such a great oxygen carrier, has an important action; and carbonic acid must not be disregarded. I believe carbonic acid has a greater effect than is ordinarily

realized even in high-pressure steam-boilers. It must not be forgotten that high pressure favours the action of carbonic acid, and that the water is introduced at the top pressure before it reaches the top temperature. A common remedy in the case of steel boilers where the character of the water cannot be changed, is to put in plates of zinc which should be (in any way) in metallic contact with the steel; thus providing a negative agent, and rendering all parts of the steel more positive in comparison.

Again, the corrosion of stone is due either to acids in the air from combustion of coal gas, &c., or even of carbonic acid. The oxidation of organic matters in water is encouraged by light, which enables the minute green or brown plants to grow, to use up and oxidize impurities, and destroys injurious germs. But, of course, this tends to make the water cloudy; so that, if your water is good and clear, darkness may be desirable.

On the motion of the PRESIDENT, seconded by Mr. W. G. PEIRCE (Richmond), a very cordial vote of thanks was tendered to the lecturer.

VOTES OF THANKS.

At the conclusion of the discussion on Mr. Devonshire's paper at Friday's sitting, several votes of thanks were passed.

Mr. C. SAINTY (Windsor) said he was proud to have the honour of proposing a hearty vote of thanks to the Mayor and Corporation. He was sure the Association had never been treated better than they had been at Hastings. Certainly, the town possessed an excellent and genial Mayor. He had treated the members right royally; and they would go away impressed with the great kindness and hospitality they had received at his hands, and the good wishes he had expressed to them as an Association.

Mr. H. E. STILGOE (Dover), in seconding, said the members would leave the town with feelings of great thankfulness for all that had been done for them during their visit.

Very heartily the motion was acquiesced in.

Mr. W. MILLHOUSE (Scarborough) proposed a cordial vote of thanks to the authors of the interesting papers they had had read. That they had given rise to so much discussion was an evidence of their value and interesting character.

Mr. G. GREENSLADE (South Hants Water Company) seconded the motion. He said the previous day they had a theoretical paper from Mr. Klopp; and he sincerely hoped that some member would take up the matter, and follow the question of the relationship between capital and working expenses, and give them actual experience of what had happened. The paper, however, produced a large amount of discussion, and in that way was useful. Then they had the paper on the further extension of the Wallasey Water-Works by Mr. Crowther; and it was a matter of great regret that the author was not present when it was read. He thought that members who prepared papers should endeavour to be present to read them. The paper from Mr. Devonshire was a very valuable one; and it would form a good and instructive addition to their "Transactions."

The motion was unanimously carried.

Mr. DEVONSHIRE, in moving a vote of thanks to the Council and officers, first returned thanks for the kind acknowledgment to the authors of the papers. Regarding his motion, he said he had, being in London, many opportunities of seeing their Secretary during the year; and he knew the great amount of work required of him and of the Council. They must feel very gratified that they had a Council and Secretary as active as the gentlemen they saw before them. The rules had been revised by the Council, and were about to come before the members. He hoped the Association would benefit by the experiences of their Past-Presidents and past members of the Council for many years to come, as well as retain the services of their present officers.

Mr. H. PRESTON (Grantham) seconded the motion; remarking upon how well the science of water engineering was represented upon the Council. The work of the Association was looked after extremely well.

The motion was cordially passed.

Mr. F. J. BANCROFT (Hull) had great pleasure in proposing a vote of thanks to the President for the arrangements he had made for the reception of the members in Hastings, for the admirable detail drawings round the room, for showing the members his works, for the facilities he had secured them, and for the excellent way in which he had conducted the meetings.

Mr. F. GRIFFITH (Leicester) seconded the motion, observing that this was one of the finest meetings they had had.

The motion was carried with applause.

The PRESIDENT acknowledged the kind words employed by the proposer and seconder, and the warm-hearted manner in which the members had carried the motion.

This concluded the technical and business part of the meeting; and the members then privately considered the question of the revision of the rules, as proposed by the Council.

ANNUAL DINNER.

The Albany Hotel was the scene of the annual dinner on Friday evening; and it was a brilliant affair. The President was in the chair; and the Mayor and the Deputy Mayor were respectively on his right and left. Other Aldermen and Councillors, together with the Town Clerk, and some gentlemen prominently identified with the work of the town (including Mr. C. E. Botley, the Gas Company's Engineer) were the guests of the Association. After dinner and the loyal toasts, a programme of songs and toasts combined to fill a most delightful evening, which passed all too rapidly. "The Mayor and Corporation of Hastings" was given by Mr. C. W. Tagg, and was responded to by his Worship. "The British Association of Water-Works Engineers" was proposed by Dr. Bagshawe, and was replied to by the President. "The Council and Officers" was given by Mr. Easton Devonshire; and response was made by Mr. H. E. Stilgoe. "The Visitors" was proposed by Mr. W. Matthews, and responded to by Mr. W. Carless. The speeches were most apposite to the occasion; and the music and songs were excellent. The arrangements for the evening had been made by the President; and the energy of the Secretary (Mr. Percy Griffith) was brought to bear in seeing them carried through with the precision which adds so much to both pleasure and comfort on such an occasion.

Visits to the Hastings Water-Works.

THE FILSHAM PUMPING-STATION.

The weather on Friday was a great improvement on that of the previous day; and the members in the morning looked forward with considerable pleasure to a drive in the afternoon, the itinerary for which included the Filsham pumping-station, and West Hill, Newgate, and Fairlight reservoirs. The anticipation was rewarded in the realization; for the scenery through which the visitors passed embraced some of the most beautiful of that with which Hastings is so richly endowed, and for which it is so deservedly noted.

The Filsham Water-Works are of a very substantial character. The wells (two of which are in the engine-house) are 96 feet deep, connected by a heading; and there is also a heading running in a northerly direction in the sandstone formation. The President has proved by deep borings within a few hundred yards of these works that they are situated on the edge of a fault, and that the outcrop drained by them is extremely small. The springs are situated some 20 feet or so below the invert of the headings. The machinery installed at this station consists of a pair of compound surface-condensing beam-engines, each capable of raising 49,000 gallons of water per hour; the rams forcing 29,000 gallons per hour to a height of 300 feet, and the well pumps delivering 20,000 gallons per hour into a low-level reservoir at an altitude of about 60 feet above the engine-house floor-level. The two wells (9 feet in diameter), situated at opposite ends of the engine-house, are connected by a heading at a depth of 94 feet below the engine-house floor. In each well is fixed a set of three-throw pumps, 15 inches diameter by 24-inch stroke, of the ordinary bucket-and-plunger type, driven by spur-gearing from the main shaft of the engine. The engines, it was ascertained, have a high-pressure cylinder 19⅝ inches in diameter by 3 ft. 9 in. stroke, and a low-pressure cylinder 30 inches in diameter by 5 ft. 6 in. stroke. The condensers, air vessels, and No. 1 well are situated in the basement under the engine-house, and are somewhat difficult of access for repairs. The engines are fitted with a cut-off of a very unusual type, consisting of trip-gear. It is very effective, but causes considerable shock on the way-shaft connected with the high-pressure cylinder. Steam is supplied to these engines by three Lancashire boilers, each 26 feet long by 8 feet in diameter, having a working pressure of 80 lbs. on the square inch.

The buildings consist of an engine-house, 96 ft. long by 21 ft. wide, and 24 ft. high to the springing of the roof; a boiler-house 36 ft. long by 33 ft. wide, and 19 ft. high to the roof; a coal-store capable of holding 300 tons of coal; and a workshop 39 ft. long by 26 ft. wide. The chimney shaft is 100 feet in height, but is situated some distance from the boiler-house.

The main from the Filsham pumping-station is 12 inches in diameter as far as the West Hill reservoir, which, the visitors learned, is about 145 feet above Ordnance datum, and is continued thence to the Newgate reservoir, partly as an 8-inch, and partly as a 6-inch main. The main from the pumping-station to the Filsham reservoir, which is about 97 feet above Ordnance datum, is 10 inches in diameter.

THE NEW WORKS IN THE BREDE VALLEY.

The whole of Saturday morning was devoted to a visit to the new water-works pumping-station in the Brede Valley, within a few miles of Hastings, which the growing requirements for water demanded should be commenced in 1899—the test-pumping which the President carried out having proved very satisfactory. The drive was through interesting country. The works which the visitors inspected may be briefly described as follows: There are two wells—known as Nos. 1 and 3—which are situated on the northern side of the valley. These have been sunk to a depth of 270 feet. Well No. 2 (which is situated 900 feet from Nos. 1 and 3, and on the southern side) has been sunk to a depth of 210 feet. The wells are each 9 feet in diameter, and lined with cast-iron cylinders to a depth of 60 feet, from the ground surface. Below this point to the bottom, they are lined with 9 inches of brickwork, built in Portland cement mortar. The brickwork is backed with clean rubble; and apertures are left wherever water was met with, so as to allow free access to the well. Wells Nos. 1 and 3 are connected by a heading 10 feet from the bottom of Well No. 1 is connected with well No. 2 by a heading driven right

across the valley. The headings are 6 feet in height by 4 feet wide at the springing, and 3 ft. 6 in. at the invert. In addition to the main headings, there are several branch headings.

The water from the Brede works is pumped through a 16-inch main, nearly six miles in length, to two circular covered reservoirs to the north of the town, situated at an altitude of 510 feet above Ordnance datum. The pumping-main is laid with cast-iron pipes, 16 inches in diameter and 12 feet in length. The pipes are laid at a maximum depth of 3 feet under the ground. They are of American manufacture, and were tested under a head of 700 feet. These pipes, the President states, gave him considerable trouble, as, in consequence of being nested for shipment, a large number of them were cracked at the spigot end; but in many cases the cracks were so slight that the defect was not revealed until the test pressure was put on the pipe. The damaged pipes had to be put into a lathe, and the injured portion cut off before being laid. The covered service reservoirs are each 150 feet diameter, and have a depth of 12 feet up to the waste—each holding 1,250,000 gallons. They are built of concrete gauged 1:2:6, and lined with blue Staffordshire bricks, covered with concrete arches. Each reservoir has a 10-inch outlet, which is taken into the valve-house. The water from the reservoirs is passed through 10-inch Deacon meters, and the 10-inch main is continued to the Halton reservoirs, for the distribution of the water to the various reservoirs in the town. The two reservoirs cost nearly £18,000, and great care had to be exercised in their construction owing to the nature of the ground.

The machinery (supplied by Messrs. Tangyes Limited) consists of two sets of pumps and engines, each capable of delivering 80,000 gallons per hour to a total vertical height of 515 feet through a 16-inch main. The engines are triple-expansion surface condensing, having high-pressure cylinders 23¼ inches diameter, intermediate 30 inches diameter, and low-pressure 62 inches diameter, with a stroke of 48 inches. The engines are fitted with Meyer's variable expansion gear, adjustable while the engine is running. The rams and pumps and all working parts coming in contact with the water are lined or cased with gun-metal, and the suctions to the well pumps are suspended from large girders fixed in the well about 60 feet above the bottom. The engines and pumps are fitted with all the latest gear. The rams measure 12½ inches diameter, with a stroke of 4 feet, worked direct from the engine cross-heads. The well pumps are of the stand-pipe bucket and plunger type, two for each well, 18½ inches diameter by 36-inch stroke, and speeded for 23 strokes per minute. The well pumps are worked by steel-plate bell-cranks driven from the main shaft of the engines. Steam is supplied to these engines from four Babcock and Wilcox boilers, working at a pressure of 160 lbs. on the square inch—two being in reserve. The engine-house, which is 80 feet long by 38 feet wide by 33 feet high, is a substantial brick building with buff terra-cotta facings. The works are provided with a store capable of holding 300 tons of coal, discharged from trucks through openings in the roof.

Owing to the presence of oxide of iron in the water (both in solution and suspension), the well pumps deliver into an aërating chamber, 36 feet diameter, through a trumpet-mouthed pipe, with a second overflow basin. The water from the aërating chamber flows over a gauge into a valve chamber, and is passed through four polarite filters working under a head of 12 feet. These filters the President has adopted after considerable experience in the treatment of water containing large quantities of iron. The water, after passing through the filters, is taken to a pure-water chamber, 23 feet by 23 feet by 14 feet deep. The suction of the rams is coupled direct to this pure-water basin; and the water is delivered through a 16-inch Venturi meter and a 16-inch main to the Fairlight reservoirs.

The quantity of water expected to be obtained from the works already undertaken will be sufficient for the present requirements of the town; and every provision has been made for future extension, which will consist of additional headings. The total cost of the works will reach about £140,000; and, in addition to this, the amount spent in prospecting and in testing the district, rent, and compensation before the permanent works were undertaken amounted to close on £20,000.

These notes do not by any means exhaust all the interesting points about the new works; but they sufficiently indicate their character. With all they saw, the members were highly pleased. Light refreshments were provided at the works; and the return journey was made in time for those members who desired to do so to leave for home that afternoon or evening, after their pleasant sojourn in the town in which their President holds so prominent a position.

Society of Arts.—The annual general meeting of the Society was held on Wednesday. The report of the Council was received. It began with an expression of regret that the proposal for amalgamating the Society and the London Institution into a single corporation had not met with the approval of the general body of the Institution when it was recommended to them by the Board of Managers. The examinations had been extremely successful; the number of candidates having reached the large total of 23,803. The finances of the Society were satisfactory; the accumulated savings during the past thirty years having reached £21,000. The number of members was 3722. The Scrutineers announced the result of the ballot for the new Council, which included as President of the Society H.R.H. the Prince of Wales.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Testing of Low-Quality Gas.

SIR,—Permit me to utter a word of protest against your remarks in an "Editorial Note" on "Gas Testing," on p. 937 of last week's "JOURNAL," that "the adoption of either a fixed height of flame or a fixed illumination renders the standard argand suitable for testing all kinds of common gas," and, further, that the 16-candle flame test is "just to all qualities of gas from 16 candles downwards." I deny the latter statement *in toto*.

By your own admission, the burner, "when limited to 16 candles, does not, it is true, develop the capacity of the burner to its fullest extent." In other words, with a mere 16-candle flame, the gas is over-burnt, and the amount of deterioration which it suffers varies with the composition of the gas tested; so that a gas produced from one class of coals may be misrepresented to a much greater extent than another. The same idea is expressed in Mr. Grafton's letter on p. 976, where he states that "the 16-candle flame basis did not develop the greatest amount of light that was stored up in the gas;" a certain amount of light being "masked by a degree of over-aëration." It is, however, somewhat amusing to me to read Mr. Grafton's naïve confession that "we were all ignorant three years ago" of this matter.

In the "JOURNAL" for Jan. 6, 1903 (Vol. LXXXI., p. 28), I showed that when the two methods of testing were applied to different low-quality coal gases, there was a loss in some cases of over a candle by the 16 candle flame method; the average with sixteen different gases giving a loss of two-thirds of a candle. Further experience but confirms and emphasizes the seriousness of the loss which is entailed in this questionable method of gas testing.

I hold, with Dr. Letheby, that gas companies are entitled to all the light which can be evolved from the gas by the standard burner; and therefore the only method at once rational and just is to use the burner at its maximum efficiency—that is to say, with a full-sized or 3½-inch flame.

Sheffield, June 30, 1905. JOHN T. SHEARD.

[Our correspondent seems disposed to be a little hypercritical. It ought not to be necessary to say that we have never stated that the standard argand—however it may be used—is capable of fully developing the illuminating power of the gas under test. What we have said, and repeat, is that either a fixed height of flame or a 16-candle illumination is capable of giving comparable results, or, in other words, it is equally just to all qualities of gas below 16 candles. Mr. Sheard appears to consider it an objection to the 16-candle illumination method that the deterioration which the gas suffers varies in amount with the composition of the latter. This, however, applies also to the "full-sized or 3½-inch flame" which he advocates. A 3½-inch flame, by the way, is not exactly the same as a full-sized one. The latter fills the chimney, and is the method advocated before the "Committee on Standards" in 1895 by a deputation representing the Gas Institute and the Institution of Gas Engineers. The 3½-inch flame was adopted by the Council of the Institution of Gas Engineers in their memorial to the Board of Trade as being the most suitable for all kinds of gas made at the present time.—ED. J.G.L.]

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* BUCKLEY.)

Thursday, June 29.

Taff Vale Railway Company v. Pontypridd Urban District Council.

Occupancy of a Bridge by a Gas-Main.

In this case the plaintiffs claimed a declaration that the defendants were not entitled to maintain their gas-main across a bridge over the Galliwastad Road. The bridge was built in 1839 to provide a private footway for the benefit of the occupiers of Galliwastad Farm, and was so occupied until 1885, when part of the severed land began to be developed; and it was then used by the public for horse and wheel traffic. The officials of the Railway Company appeared to have overlooked the fact that the bridge was not a public way; and the Pontypridd Gas Company laid their main across it. In 1895, plaintiffs sought to obtain parliamentary powers for widening their line; and in the preamble of their Bill the bridge was described as a "public" bridge. The defendants opposed the Bill, and it was due to their opposition that the Railway Company's attention was directed to the fact that this was merely an "occupation" bridge. In 1901, the bridge was rebuilt by the Railway Company; and the defendants, who had acquired the undertaking of the Gas Company, were requested to remove their main, which they declined to do. It was contended on behalf of the plaintiffs that they had no power to dedicate the bridge to the use of the public, and that the pipes had been laid without their knowledge. The relaying of them on the reconstructed bridge was done with their knowledge; but there was no licence or consent on their part. All they wanted was an acknowledgment of their right as owners; and for a purely nominal yearly sum they were willing to

grant an easement. For the defendants it was urged that they had a right to lay pipes in a public road with the consent of the proper authority, and in a private road by permission of the owner; and this consent had been given.

His LORDSHIP said the dispute appeared to be about nothing at all. He could not compel the parties to come to terms after he had made a declaration that the bridge was not a public way; but if further proceedings were taken, it might be necessary to add the Attorney-General as a party to the action, in the interests of the public. He (his Lordship) was of opinion that the Railway Company had not dedicated, and could not do so, any part of their property to the use of the public; and permission had not been given to lay gas-mains across the bridge. But he made no order upon the defendants as to the removal of the pipe. The costs of the action would be paid by the defendants.

COURT OF SESSION—OUTER HOUSE.

(*Before Lord* ARDWALL).

Thursday, June 29.

Muir and Son v. Edinburgh and Leith Gas Commissioners.

Judgment in the Brewery Well Pollution Case.

In the Court of Session to-day, judgment was given in the action brought by Messrs. James Muir and Son, Limited, against the Edinburgh and Leith Gas Commissioners with reference to the pollution of a brewery well. The case was fully reported in the "JOURNAL" for March 14 last and the 6th ult.

Lord ARDWALL said that, as the penalty under the Gas-Works Clauses Act had been abandoned, the only matter to be dealt with was the claim for £10,000 damages. Reviewing the facts of the case, his Lordship said it was clearly established by the evidence that the well was polluted to such an extent as to make it absolutely unfit for brewing purposes. The only matter in doubt was how long the pollution would continue. This was an extremely difficult question, because it was not proved how the polluting material reached the well, except that it did so through the strata of the earth; and it was quite unknown over what area, or to what extent, the water-bearing strata between the gas-works and the brewery had been impregnated with tar and other polluting matters. The next question on the facts was, Where did the pollution come from? On this, he thought, there was no room for doubt. The defenders' was the only place where coal-gas tar was manufactured near the well; and it was proved that there was coal-gas tar in some of the samples. But this was a very small part of the case; for he thought that, practically, it might be taken that the polluting substance found in the well was either water-gas tar or oil-gas tar. This was admitted both by Mr. Herring and Mr. Tatlock. Taking the circumstances into consideration, he came to the conclusion that it had been established beyond doubt that the pollution came, and was coming, from the defenders' works, which were in close proximity to those of the pursuers, and which were situated on the rise of the water-bearing strata at that place from the pursuer's works. The next question was, How did the polluting material—water-gas tar, with a slight mixture of coal-gas tar—find its way from the defenders' works across the Canongate Churchyard to the well? The pursuers' case on record was that the pollution was caused by the defenders, in the course of dismantling their plant, pumping out the contents of two iron tanks, consisting of oily tar and other bye-products of gas manufacture, and knowingly allowing large quantities of the tarry residue to escape into the ground, and thence percolate into the well. This cause of pollution he held to be entirely negatived by the evidence. It was proved, he was satisfied, that the filter which was improvised by the defenders was in every way efficient; and the evidence of all concerned in the operations was to the effect that it was practically clear water which came out of the filter-bed. The pursuers' case, so far as it was founded on pollution caused by the operation of emptying the tar-tanks, had, in his opinion, entirely broken down. At an early stage of the proceedings, it appeared to him exceedingly unlikely—and, indeed, practically impossible—that a comparatively small quantity of water and tar emptied out of the tanks in question could have the polluting effect described. He thought, however, that some facts were established in the case, from which it might be surmised how the very great extent of pollution in the well occurred. It appeared that there was a drainage system of great antiquity all through the defenders' works; and it might well be supposed that several of the drains were what might be called dry-stone drains, which were a usual kind of drain built in town and country during the first half of the Nineteenth Century and previously. Mr. Herring said he could not say what these drains consisted of; that he believed the drainage system of the works to be very old; and that he did not know what sort of drain there was at the bottom of the manhole next to the water-gas tar-tanks. Unfortunately, there was no plan of the drains. Mr. Herring, however, said that the overflow from the separator, which ran down the drain into the manhole, finally got into the public sewer. It might be pointed out that in this particular Mr. Herring was entirely mistaken, and that Mr. Alexander, who was the practical Works Manager, and far the oldest person connected with the works, gave a totally different account. Apparently, the pursuers had an opportunity of going into this matter, for they found a second drain, or built conduit, 9 ft. 6 in. below the ground. They asked Mr. Alexander where it led to; and he said it was all through the works. It was notable that in this drain there was found a lump of tarry material, which turned out to consist mostly of coal-gas tar. The following facts, he thought, appeared to be established by the answers given to questions put by himself: In the first place, what had been called a drain, into which the overflow from the oil-gas tanks went, did not lead into the public sewer, and could not do so, because it was below the level of it, as was proved by the fact spoken to by Mr. Alexander—that one very dry summer they attempted to get water from the sewer, by connecting the drain with it, and letting the water run down into it by gravitation. The drain, however, as was distinctly stated by Mr. Alexander, led straight to the defenders' high well, which was 42 feet deep, and out of which they pumped water for general purposes throughout the works. The water being pumped out in this way was used over and over again, as there seemed to have been a circulating system of water through the works, so as to use as little of the town supply as possible, because it had to be paid for. Accordingly, it was proved that into the high well the whole overflow of the water-gas tar-tank went, and also, apparently, a good deal of the water which had been used for washing the gas, which would account for the presence of coal-gas tar in the drain and in the pollution at the Stable Well. Now, this high well was formed of dry rubble, so as to gather water from every side, as much as possible; and it was sunk right down to the water-bearing strata. It was probable that for many years more or less water-gas tar and coal-gas tar had been getting into the high well, and clogging up the strata; but, as the water was constantly being pumped out of the well, no great pressure was put on the strata, and the tar probably remained very much stagnant in the well and in the immediately adjacent portions of the surrounding strata. When, however, the defenders ceased to manufacture gas there, a change naturally took place; for the well would gradually get filled up with water, and oily tarry matters would be forced by the pressure into and through the strata. While he thought this was a probable explanation of how the pollution happened, and was consistent with the evidence, it was impossible to say it had been proved. The opinion at which he had arrived was that the pollution complained of was caused by gas tar which had been manufactured at, and had been allowed to escape from, the defenders' works; but that it was not directly attributable to the operations connected with the dismantling of the tar separator and tank, as set forth in the record. It was strongly maintained, for the defenders, that as the pursuers had failed in proving that the pollution had taken place in the only manner specifically set forth in the record, they must be held to have failed in their case, and that the defenders were entitled to absolvitor, or, at least, to have the action dismissed. While he thought there was great force in this argument, and that, on a *prima facie* view of the record, it seemed well founded, it would be reading the record too strictly against the pursuers to hold that no other case was contained within the part alluded to. He was of opinion that there was sufficient on record to raise a case on the facts that the pursuers maintained they had established, and, having established which, that they were entitled, in law, to succeed in their present claim. This case was (1) that the defenders manufactured, on their ground, material of a noxious character; and (2) that this noxious material had escaped from their works, and had polluted, and for the present destroyed, the Stable Well. It would be seen from what he had said that these propositions had been established by the evidence; and therefore he was of opinion that the pursuers were entitled to recover damages. The next question was as to the amount of damage. This must be treated as a jury question, because, as the manner and extent of the pollution were unknown, it was not easy to determine whether the pursuers ought to procure a new supply of similar water in substitution for the polluted well, or whether it might be accepted that the well would gradually become cleansed, and be again available, and, if so, how long this would take. He thought it was unlikely the water in the well would be fit for use within the next ten years; but during this time the pursuers, with the aid of their Brewery Well and the town water (which could be hardened and cooled at some little expense) might carry on the business. It appeared that the entire amount of town water would cost from £80 to £100 a year. Taking it at £90, this would be for ten years £900. Hardening for ten years, at £46 a year, would amount to £460; and cooling in the summer months, at £33 a year, to £330. Pumping the Stable Well for ten years, at £104 a year, would cost £1040. But it must be remembered that the town water, though hardened in the way proposed, would not be nearly so certain to make good beer as the naturally hard water; and more accidents would be likely to occur with brews made from it than with naturally hard water. The pursuers were entitled to a considerable sum upon this head, and to cover the inconvenience they had already been put to, and the risk of the taste of the tar not being out of the water at the end of ten years. He proposed to award £1000 for these items, and to give decree for £3730 damages altogether. He thought that the pursuers ought not, in view of the possible risks, to be deprived of the advantage of present payment; and if they wished to apply the sum awarded to the getting of a new supply of water, they should be enabled to do so. In respect that the pursuers did not now insist upon their claim for penalties, he gave the defenders absolvitor from the conclusions to this effect. The pursuers were found entitled to expenses.

DEVON SUMMER ASSIZES.—Wednesday, June 28.

(*Before Mr. Justice* RIDLEY.)

Settlement of the Devonport Slander Action.

To-day there was set down for hearing, before a Special Jury, the action brought by Mr. Sidney E. Stevenson, late Gas Engineer at Devonport, against Mr. William Hornbrook, the Chairman of the Gas Committee, for damages for slander in connection with the recent unfortunate controversy in the town. About thirty witnesses were in attendance; but their services were not required, as it was announced that a settlement had been arrived at.

Mr. J. A. FOOTE, K.C., and Mr. HOLMAN GREGORY appeared for the plaintiff; and Mr. CLAVELL SALTER, K.C. and Mr. W. T. LAWRANCE for the defendant.

Mr. FOOTE, in announcing the settlement, said he would not recall the expressions used, which were the subject of the action, because he had always held that the less said on these occasions the better it was. But it was felt by Mr. Stevenson that the language used by Mr. Hornbrook on the occasions referred to was such as, properly understood, imputed to him either dishonesty or some impropriety of conduct.

The defendant had now undertaken by his Counsel to say that he made no imputation, and had not made any imputation of dishonesty or impropriety of conduct on the part of Mr. Stevenson.

Mr. CLAVELL SALTER said he would like to make just one or two remarks. At the time when a certain meeting was held, which formed the subject of the action, there were some differences existing in regard to the general conduct and management of the gas undertaking; and the plaintiff tendered his resignation of the position of Engineer. That resignation it was for the Council to accept; and it was at the time pending. It was in these circumstances that the Mayor of Devonport, on the requisition of certain ratepayers, convened a meeting of ratepayers for the purpose of a public discussion of the gas question. Mr. Hornbrook was in attendance, and was called upon to speak in defence of the position which his Committee had taken up. It was in the course of a speech Mr. Hornbrook delivered at this somewhat noisy and turbulent meeting that he made use of the words which were set out in the pleadings. Mr. Hornbrook instructed him to say that immediately after speaking the words, he felt they were stronger than the occasion or the circumstances warranted. At the time he uttered them he requested the representatives of the Press not to report them. He also took steps the same evening to see that they did not go into the papers; and they did not.

Mr. FOOTE: I have no doubt that the defendant intended to keep them out of the papers; but they did appear in them.

Mr. SALTER replied that at any rate Mr. Hornbrook did his best, and called upon the reporters at the time not to insert them. The reason why Mr. Hornbrook felt that the words were too strong was that to some extent they might convey an imputation either of dishonesty or impropriety of conduct. It was not Mr. Hornbrook's intention to make such an imputation against Mr. Stevenson. He was referring to matters which had arisen in regard to the conduct of the gas undertaking; and he had no intention of referring to anything else. Mr. Hornbrook had not sought to justify his words in his pleadings; but he had pleaded that the occasions were privileged. Mr. Hornbrook had placed himself in his (Counsel's) hands; and he had advised him with regard to one of those occasions that it might be one of difficulty for his Lordship to decide as to whether it was an occasion of privilege or not. Accordingly, he had agreed with his friend for judgment to be entered for the plaintiff upon terms.

The precise terms of the agreement were later communicated to the Press; and it was then ascertained that judgment had been entered in favour of the plaintiff; Mr. Hornbrook to pay him £250, and costs on the higher scale.

A Point as to the Supply of Water for Trade Purposes.

At the Halifax Borough Court some days ago, the Magistrates were called upon to decide a dispute between the Corporation and one of their customers with regard to the charge made for water supplied for trade purposes. The Corporation sought to recover from Messrs. Oates and Green, Limited, £26 4s. 2d. for water-rate; the charge having been made out on the same basis as defendants had several times previously paid upon. On the present occasion, however, objection was taken on the ground that the defendants' three works, if taken together (as it was stated had been done in other cases), would be chargeable at the lowest rate, as the total consumption would exceed the amount necessary to justify this. As the three works were separated from each other by some hundreds of yards, the Corporation regarded them as separate; and as not one of them alone consumed the requisite quantity of water for the minimum charge, the accounts were made out at the higher rate. A witness for the Corporation stated that works were regarded as one when there was communication between the buildings without actually going outside; and the defendants argued that they complied with this definition, as there was an underground passage between their premises—though it was admitted this "passage" was in reality a clay-pit. The Bench decided unanimously that the charge was correctly made; but about £21 of the amount named was not recoverable, owing to proceedings not having been commenced within six months of the cause of action arising.

Another Well Pollution Case.

At the Halifax County Court last week, his Honour Judge Heaton Cadman had before him the adjourned case of *Mitchell v. Halifax Corporation*. The proceedings at the first hearing were reported in the "JOURNAL" for March 14 (p. 717). James Mitchell, a grocer, of Ovenden, sued the Corporation for £25 damages sustained by reason of the contamination of a well by an escape of coal gas (5 yards from the surface), owing to leakage from a gas-main. The plaintiff's case was that he dug a well in 1900 at Ovenden. It was 39 yards deep, sunk in the solid rock; and the water was good until 1903 or 1904, when there was a taste as of coal gas or other contamination. He went to considerable expense in puddling the well and in securing it from possible contamination of a neighbouring tip before the real cause was found out. The plaintiff based his case on negligence by the Corporation in the laying of the gas-pipes and also in the absence of any methods by which they could detect leakages from mains. The Corporation contended that there was no proof that the contamination was caused by gas. His Honour, however, decided that there was gas pollution, and that it arose from leakage from the Corporation mains. He found there was negligence in laying the mains, and gave a verdict for £7 and costs on Scale A, with the expert fee for one witness.

Cheaper Gas for Motive Power at West Bromwich.—The Gas Committee of the West Bromwich Town Council have had under consideration the prices at present charged for gas, and have decided to make a substantial reduction in the charges for gas for motive power and manufacturing purposes. The new scale, which came into force on Saturday, is: Under 50,000 cubic feet, 2s. per 1000 feet; up to 200,000 cubic feet, 1s. 10d.; up to 500,000 cubic feet, 1s. 7d.; beyond this quantity, 1s. 5d.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill presented, read the first time, and referred to the Examiners: South Barracas (Buenos Ayres) Gas Bill.

Bills read a second time and committed: Bolton Corporation Bill, Bootle Corporation Bill, Skegness Water Bill.

Bills read the third time and passed: Gas and Water Orders Confirmation Bills (Nos. 1 and 2), Local Government Provisional Order (Gas) Bill, Swansea Corporation Bill.

Bills Royal Assented: Accrington District Gas and Water Board Bill, Arbroath Corporation Water Order Confirmation Bill, Aylesbury Gas Bill, Birmingham Corporation Bill, Brentwood Gas Bill, Brompton, Chatham, Gillingham, and Rochester Water Bill, Colne Corporation Bill, Croydon Corporation Bill, Croydon Gas Bill, Dundee Water Order Confirmation Bill, East Cowes Gas Bill, Epping Gas Bill, Grangemouth Water-Works and Burgh Extension Order Confirmation Bill, Great Berkhampstead Gas Bill, Higham and Hundred of Hoo Water Bill, Loughborough Corporation Bill, Morley Corporation Bill, North Sussex Gas Bill, Otley Gas and Improvement Bill, South Metropolitan Gas Bill, South Oxfordshire Water and Gas Bill, South Suburban Gas Bill, Stockport Corporation Bill, Tralee Urban District Council Bill, Truro Water Bill, Walker and Wallsend Union Gas Bill, Wrexham Gas Bill.

HOUSE OF COMMONS.

Tuesday, June 27.

LOCAL BORROWINGS.

Mr. BRIGHT asked the President of the Local Government Board whether his attention had been called to the practice of some local authorities to borrow money for special purposes by an overdraft instead of by recourse to the method provided by statute; whether, in Provisional Orders of the Local Government Board presented to the House for confirmation, such borrowings had been legalized; if so, whether, in each of such cases, an inquiry had been made in the presence of the ratepayers affected, and the circumstances recorded; and what were the number and amounts of such borrowings so legalized since 1895, and at present intended by the Board to be legalized.

Mr. GERALD BALFOUR: I am aware that in some instances local authorities have borrowed money by means of unauthorized overdrafts. The Local Government Board strongly disapprove of this practice; but there have been cases in which they have considered that the facts justified the insertion in Provisional Orders of clauses conferring borrowing or other powers on the local authority with a view to the overdraft being paid off. In each case, before the Order has been made, a local inquiry has been held, after notice inviting any person interested to attend; and the circumstances have been reported to the Board by the Inspector holding the inquiry. Cases of the kind since 1895 have not been numerous; but an examination of the papers relating to a very large number of Provisional Orders would be necessary before the precise facts could be given.

Mr. BRIGHT asked whether it had been and was the custom to surcharge members of a council who exceeded their powers.

Mr. GERALD BALFOUR replied in the affirmative.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time and referred to the Examiners: Gas Orders Confirmation Bill, Gas and Water Orders Confirmation Bills (Nos. 1 and 2), Shepton Mallet Gas Company (Electric Lighting) Bill.

Lords Bills read a second time and committed: Bangor (County Down) Water and Improvement Bill, Gas Orders Confirmation Bill, Llandrindod Wells Urban District Council Bill, Matlock Bath Improvement Bill, Southport, Birkdale, and West Lancashire Water Board Bill.

Bills reported: Malvern Water Bill, Mansfield Corporation Bill [Lords], Nottingham Corporation Bill [Lords], Tees Valley Water Board Bill [Lords], Whitby Urban District Council Bill [Lords].

The Southport, Birkdale, and West Lancashire Water Board Bill has been referred to a Select Committee, consisting of Sir A. H. Brown (Chairman), Sir Thomas Roe, Colonel Warde, and Mr. Rowland Hunt; to meet next Thursday.

GAS COMPANIES AND ELECTRIC LIGHTING ORDERS.

The Electric Lighting Provisional Orders (No. 5) Bill, containing the Hessle and Surbiton Orders, came last Wednesday before a Committee of the House of Commons presided over by Sir JAMES WOODHOUSE, the other members being Captain Bagot, Mr. Fitzroy, and Mr. Haviland Burke. Both Orders were opposed by Gas Companies.

HESSLE ORDER.

This Order was applied for by the Hessle Urban District Council, to enable them to provide a supply of electrical energy in their district.

Mr. HUTCHINSON appeared in support of the Order; Mr. RAM, K.C., represented the Hessle Gas Company.

Mr. HUTCHINSON, in opening the case for the promoters, said that

Hessle was an urban district on the Humber, contiguous to, and adjoining, the city of Hull. It had an area of some 2111 acres, and a population of 4800; while the number of occupied houses was 1132. The rateable value was £27,000. The debts were exceedingly small. The charge in respect of electric lighting would be made upon the security of the district rate; and the only indebtedness upon the rate was £6482. The Council's borrowing power was equal to twice the assessable value of the property; and their margin of borrowing power was something like £36,000. Building operations in Hessle were proceeding very rapidly; and the electric light undertaking would be of considerable advantage. The only opposition was that of the Hessle Gas Company, and he would go direct to their petition. Gas was at present supplied by them, and they were a non-statutory Company; but they were seeking statutory powers this session. For some years the Company had been breaking up the streets in Hessle, and supplying gas merely upon the goodwill of the Council. An undertaking of this sort had no powers which it could lawfully exercise, even with the consent of the Council. The Company said they were apprehensive that the Council would be enabled, by falling back upon the rates, to compete with them. This was precisely the argument they had used with the Board of Trade at the inquiry held prior to the granting of the Order; and it failed entirely. A clause which provided that no deficiency of any kind should fall upon the rates, but should be met by the consumers of electrical energy, was put into the Order; and in this respect the Company had nothing to complain of. Then the Company said that the district was one in which at present the supply of electric energy must be attended with very grave risk as to its being profitable. They said there were only 170 houses with a rateable value of £30 and upwards; but in this they were incorrect. They then said that the undertaking would result in a considerable deficiency in the revenue, and the effect would be to benefit a small number of persons at the expense of the general ratepayers, as there were no proper provisions in the Order for compelling the Council to carry on the undertaking so as to be self-supporting. They stated that they were prepared to show that the application was made by the Council really with the view of preventing others from obtaining an Order. Before the Company came to the House, the Council had taken an objection to their *locus* before the Court of Referees.* Two or three Provisional Orders were considered by the Court on the same ground; and the decision was that Mr. Ram should not be enabled to appear before the House upon every ground set out in the petition. His *locus* was limited. The whole of the argument put forward on behalf of the Company before the Court of Referees turned on one question only—the competition between the Company and the District Council if the latter had granted to them the powers contained in the Order. By the decision of the Court of Referees, his friend was not entitled to proceed upon the whole of his petition, but only on that part which related to competition between the supply of gas and the supply of electricity. Clause 8 of the Order was the standard one, whereby the working of an electric lighting undertaking, with that clause in the Order, could not in any event result in a charge upon the rates. At the end of the fifth year after the undertaking came into operation, the expenses of carrying it on would be reviewed; and it was the duty of the Urban Authority at the next ensuing period of three years to make the price of electric energy supplied to the consumers such that the revenue would at least equal the expenditure, and therefore no charge would be thrown upon the rates. There were in the clause other provisions to the like effect. It was the model clause, which had been carefully thought out. The Company stated that by clause 8 of the Order provisions were inserted with the view of making the Council charge sufficiently high prices for electrical energy to make the undertaking self-supporting, but that these provisions were inadequate for the purpose. This, Council contended, was not the case. Though the Company had said that there was great risk of the supply of energy not being profitable, and that the district was small, they had placed evidence before the Chancery Division of the High Court in order to show that they were justified in obtaining an extension of their Memorandum of Association; and this evidence did not agree with their statement that there was no public demand. They said they were in a position to supply electric energy themselves, having obtained an addition to their Memorandum of Association, and were prepared to apply for a Provisional Order to supply electricity in the district when there should be such a demand as would render it reasonably possible that the undertaking could be carried on at a profit. The Company practically said: "Here is an Urban District Council who are going to compete with us. Preserve to us the monopoly which we are during the present session asking Parliament, so far as lighting is concerned, to grant us." But on behalf of whom were they appearing? So far as they themselves were concerned, in a week or two they would die. They were appearing on behalf of shareholders of a Company which was not yet in existence; and though these shareholders might be prepared to apply to Parliament for a Bill to supply energy, they had never been consulted. So that Mr. Ram was appearing before the Committee entirely under false colours. If his friend were able to induce the Committee to refuse the Order on the plea that he was the proper person to supply electric energy to the district, the residents would not be able to obtain a supply from him, because he had no power to devote capital to the purpose. The opposition of the Company was what was called in the corridors merely a "blocking" one. The Company sought to stop the Council for the purposes of their own undertaking. The evidence would show what the desire of the district was. It was their intention to carry out an electric lighting undertaking at once, either with or without the assistance of the Hull Corporation.

Mr. *Appleton*, the Chairman of the Hessle Urban District Council, was then called. In answer to Mr. HUTCHINSON, he said the district ought now to be supplied with electric light, and the undertaking could be made to pay. He had approached the Hull Corporation on the matter, and they were prepared, on suitable terms, to supply current in bulk. The population had increased, on an average, 7 per cent. per annum; and the rateable value had gone up 25 per cent. in six years. A number of the houses recently built had been wired for the supply of electric light; and the Council intended to light the streets by electricity. They paid the Gas Company £436 for public lighting in 1903-4; so that they would have this revenue from the electricity works. There were a number of large public buildings in the district where electric energy would be used. The gas in Hessle cost 3s. 6d. per 1000 cubic feet, against 1s. 10d. in Hull.

In cross-examination by Mr. RAM, witness said that Hull had large docks and so forth, and a population of 250,000, and had a quantity of electric energy taken for power purposes. There was only one manufacturer in Hessle. They might supply energy to the shipbuilding yards; but they had not approached them on the subject. The Council had tried to purchase the Company's undertaking. He did not see why the Provisional Order, if granted, would depreciate the position of the Company. No local inquiry had been held upon the question of applying for the Order.

Mr. *Millington*, a member of the Hull City Council, and Chairman of the Electric Lighting Committee, said that Committee had had before them the question of the supply of electricity in bulk to Hessle, and were willing to do it. He believed an electric light undertaking would be remunerative.

In cross-examination by Mr. RAM, witness said electricity was supplied in Hull at 4½d. per unit for lighting and 1d. for power.

Mr. *H. Bell*, the Electrical Engineer to the Corporation of Hull, said he was first asked to advise the Hessle people upon the electric lighting question in the early part of 1904. He believed the undertaking would be successful.

In answer to Mr. RAM, witness said he estimated that 63,000 units would be sold in Hessle to private buildings. Hull could supply electricity in bulk to Hessle at 3½d. per unit. He based the figure of 63,000 units partly on the population and partly on the street lighting. If the population were 5000, that would only give 35,000 units for them, and the rest would have to be made out of street lighting.

Mr. *Dawson*, a member of the Hessle Urban District Council, and Mr. *Bradley*, a coal exporter and merchant residing at Hessle, gave evidence as to the desire existing for electricity there.

Mr. RAM then addressed the Committee on behalf of the petitioners. He said he would not call evidence, as on the main facts they were practically agreed. He thought he had been justified in saying that the scheme was not a *bonâ-fide* one. He maintained that the statements in the petition, which had been referred to by Mr. Hutchinson, were correct. If the Committee confirmed the Order, he would ask them to modify clause 8, which he maintained was not sufficient to carry out the purpose it was intended to serve.

The Committee then deliberated in private. On the re-admission o f the parties,

The CHAIRMAN said the Committee were of opinion that the Order should be confirmed, subject to what Mr. Ram had to say on the modification of clause 8.

This point was reserved till the following day.

At the sitting of the Committee on Thursday,

Mr. HUTCHINSON said they had communicated with Mr. Pelham, at the Board of Trade, and the Board were strongly averse to the proposed alteration of the clause; and if the Committee would like to hear Mr. Pelham, he would be prepared to come before them to state the objections the Board had to the clause.

The CHAIRMAN remarked that if it should appear that the Committee would want the services of Mr. Pelham, they would send for him.

Later in the day the clause came up for consideration.

Mr. RAM said the point he wished to make was this: The clause was settled by the Duke of Northumberland's Committee according to the lights then existing; it was never intended to be settled for all time. There had been a modification of it by no less an authority than the Police and Sanitary Committee. What he asked was that, in reference to three or four particulars, the Committee would say that, having regard to the facts of the case, they were prepared to make such modification of certain of the enactments of this clause as would render it applicable. He asked them to say that the period of revision every five years was certainly too long. On the other hand, one year would be too short; and therefore he asked them to make it every third year. The next point was as to the provision that the undertakers should "revise and thereafter maintain the scales of prices charged for electrical energy under the Order, so that, so far as is reasonably practicable, no rate will be required," &c. He asked the Committee to leave out the words "so far as is reasonably practicable, no rate will be required," and to substitute "so that no money raised by any rate will require to be used;" and then it went on, "for the purpose of defraying the future expenses of the said undertaking during the next three years." He wished that there should be absolute security against ratepayers being saddled with any expense or loss. He also asked that after the word "undertaking," in the same subsection, the Committee should insert the words, "including the amount required for interest on moneys borrowed and instalments on principal and payments to the sinking fund in respect of moneys borrowed." It was not denied that these were matters that ought to be provided for. Then, with regard to subsection 3, he asked that the price to be charged for energy should be subject to revision at the "next revision" provided for, instead of at the "triennial revision." Finally, in subsection 4, there was a matter of wording, and he asked that "under like conditions" should be substituted for "for similar purposes." As the clause stood, he could see nothing short of a *mandamus* to compel the promoters to act in accordance with it; and he proposed that there should be a new subsection in order to make the clause really operative.

The CHAIRMAN informed Mr. Hutchinson that, with regard to precedents, he much preferred to deal with these cases upon the particular facts which were before them.

Mr. HUTCHINSON, in reply, said that Mr. Ram had shown no peculiar circumstances which were applicable at Hessle. The clause had been inserted in a good many Orders, and his friend had not submitted a single amendment which was not put to the Duke of Northumberland's Committee and argued out day after day. It would be time to amend

* See "JOURNAL" for the 6th ult. (p. 727)

the clause when it was shown it was impracticable. He also submitted that, so far from being an improvement, the amendments would make the clause impracticable.

The CHAIRMAN said the Committee did not see their way to alter the common form of Order in any of the respects suggested.

SURBITON ORDER.

On Thursday, the Committee had under consideration the Provisional Order of the Surbiton Urban District Council.

Mr. WEDDERBURN, K.C., appeared for the promoters; and Mr. HUTCHINSON opposed on behalf of the Kingston-on-Thames Gas Company.

Mr. WEDDERBURN, in opening, said that in 1891 Surbiton obtained an Order; and this gave them as their electricity area the then existing urban district of Surbiton. Since then there had been extensions of the urban area in 1894 and 1895; and these extensions were really the cause of the Order. The rateable value of old Surbiton was £154,000; and the additional part was of a much smaller rateable value, some £30,000—making a total of nearly £185,000. In 1902, they had a loan of £50,000; but even then they did not think it right to provide electricity themselves, but entered into an agreement for a supply. The agreement was made in 1902; and by it the Council were to provide with their £50,000 the site, the buildings, and the generating station. The Company were then to find all plant and apparatus, and pay the expenses of management and the interest and sinking fund instalments. So the position from 1902 till as long as the agreement lasted was this: The Council were the owners of the generating station which they built, and they practically leased their whole undertaking to the Company. The Company paid the Council by way of rent such a sum as enabled them during those years to pay off the interest and sinking fund; and the Company made what profit they could out of the electric lighting. The only point there was raised by the Gas Company. He thought Mr. Hutchinson would agree with him that the whole question was whether or not there should be inserted in the Order the "Bermondsey" clause. The Board of Trade had come to the conclusion—and he thought rightly—that this was obviously not a case in which they could insert the provision.

The CHAIRMAN: On the ground that they are protected by the terms of contract?

Mr. WEDDERBURN: Yes.

Mr. *F. J. Bell*, the Deputy-Clerk to the Urban District Council of Surbiton, bore out Counsel's statement as to the present position of affairs in Surbiton. He said the only circumstances in which the Council could take over the duties of the Company were if there was a good chance of there being a profit, and no deficiency to be met by the ratepayers.

Mr. HUTCHINSON: Why do you object to insert this clause?

Witness: One ground would be that it would interfere with past legislation—legislation on which we have borrowed money—and also with the agreement.

Mr. HUTCHINSON put it to the witness that, under the Electric Lighting Acts, the Council were required to fill up annual statements of accounts prescribed by the Board of Trade. Then he put it that, under the agreement, the Council had to provide the buildings and the generating station at a cost not exceeding £6000, and asked who had to pay the interest and sinking fund on this.

Witness: The Company.

But it cost £6670; and it is specially provided in the agreement that they shall not pay interest and sinking fund on any more than £6000?

Witness explained that, when the buildings were being erected, they were requested to expend a rather larger amount than £6000; and it was settled by correspondence that they should spend up to £8000.

Mr. HUTCHINSON elicited that there was no agreement under seal for this extra expenditure, and said there was no obligation on the Company to pay the money. Therefore, there was risk of loss. Turning to the obligation of the undertakers to provide an annual statement of accounts, he submitted that the Council had agreed with their Contractors to do this; and he suggested that it was not permissible for the Council to delegate any one of their statutory duties. Here they were actually attempting to delegate to contractors the preparation and publication of accounts, which the Electric Lighting Act said should be done by the Council.

Witness said he presumed if they obtained their Auditors' certificate and forwarded it to the Board of Trade it would be sufficient.

The CHAIRMAN: Now, Mr. Wedderburn, how is this going to do you any harm?

Mr. WEDDERBURN replied because it was not applicable. The first part of the clause was a repetition of the law as to accounts; and they did not want that. In reply to a further question, he said that if the Committee put the clause upon the Council, they might place them in this position: That whereas they would have taken over the undertaking without the clause, sooner than take it over with the clause, they would not do so. It would hamper them in a very special way. They would say: "This clause will make it so difficult to work that we shall not take it over."

Mr. *Bell*, in further cross-examination by Mr. HUTCHINSON, said that if they obtained the Order, the supply of electrical energy would be confined entirely to their own district.

Mr. HUTCHINSON: Have you actually sealed a contract with the Twickenham Electric Lighting Company to supply them in bulk outside your own area?

Witness: We have consented to Callender's (the Contractors) supplying them in bulk.

In reply to Mr. WEDDERBURN, witness said that, even if there was any loss in the Twickenham case, it would fall upon the Company.

Mr. HUTCHINSON, for the Gas Company, said the question as to whether ratepayers should be protected against the acts of the municipal authority had been a vexed one; and he went on to refer to the circumstances which gave rise to the Bermondsey clause, and cited cases where it had been inserted. Mr. Wedderburn was in error when he said there was no parallel case in the Orders that came before the Committee. The Watford Urban District Council, who were the undertakers and who were working an undertaking, as this Council ought to do, applied for an extension of their area of supply, so that it should be co-terminous with the Urban District of Watford. In that case, without hesitation, and also in the cases of Huddersfield and Maidenhead, the clause was applied; the only difference being one of terms of revision between new and old undertakings. In the case of the Hampton Order, the undertaking was to come into the hands of the Council at an agreed period of 35 years; yet the Committee said the principle of the clause was so direct that, even in this case, they would insert it. As to publishing accounts, the Surbiton Council were actually at the present time neglecting to do their duty; they had entered into a pecuniary contract with the Contractors that they should discharge the duty which the Council ought to discharge. The Northumberland Committee decided as a matter of public policy that the provisions with regard to the publication of accounts, where it could be shown that there was risk of loss, were insufficient, and that further obligations as to publication ought to be imposed. Was there a risk of loss here? He said that there was not only a risk of loss, but there was an actual loss. Look at the question of depreciation! Not a single farthing did the Council impose upon their Contractors for depreciation or replacing of machinery. He contended that he had established, by precedent, by parliamentary practice, and by the particular practice of this Local Authority, that they had not established their case; that there was a risk of loss to the ratepayers not only referable to the new area, but referable to the existing undertaking; and, just as in Watford it was imposed upon the Local Authority, it ought to be inserted here.

Mr. WEDDERBURN said the Watford case was entirely different, because they had been carrying on the work for four years at a loss.

After a few minutes' consideration in private,

The CHAIRMAN said: In this matter the Committee are of opinion that the Order should be confirmed.

ADMINISTRATIVE COUNTY OF LONDON AND DISTRICT ELECTRICITY BILL.

Standing Orders Dispensed With—Bill to Proceed.

The House of Commons Committee on Standing Orders sat in private last Tuesday and considered the above-named Bill as amended by the House of Lords. The Examiners of Private Bills (Messrs. Campion and Jeune) had reported that the Standing Orders had not been complied with; the South Metropolitan Gas Company having contended that proper notice had not been given them regarding a clause that had been inserted conferring upon the promoters running powers over the Company's railway. As stated in the "JOURNAL" last week, the Examiners upheld this contention. After briefly considering the case, the Committee decided that compliance with the Standing Orders might be dispensed with, and that the Bill should be allowed to proceed.

SOUTH BARRACAS (BUENOS AYRES) GAS BILL.

Before the Standing Orders Committee of the House of Lords last Tuesday—the Earl of Onslow presiding—application was made that the Standing Orders might be suspended so as to allow of the introduction of the above-named Bill. It was stated that the matter was very urgent, in consequence of the capital of the Company standing at a certain figure. The Directors desired to acquire a new concession, and for this purpose to re-arrange the capital. It was purely a "domestic" matter; and the application was made in consequence of the Bill being a late one. The Lord Chairman gave the leave applied for.

Mond Gas for Boiler Firing.—At a recent meeting of the South Staffordshire Mines Drainage Commissioners, it was stated that the whole of the boiler plant at Bradley, New Moat, Stowheath, and No. 3 Lower Bradley had been satisfactorily fired with Mond gas. This is part of the general engineering scheme for the Tipton district; and it is proposed to greatly extend the use of Mond gas in its development.

Inspection of the Rhyl Water-Works.—The annual inspection by the District Council of the Rhyl Water-Works took place a few days ago. The most attractive feature was the new reservoir at Dolwen Llanefydd, which will soon be ready for use. It will hold 50 million gallons of water—exactly the quantity the old reservoir will contain. The engineering difficulties were considerable; and to prevent percolation a trench of 112 feet deep had to be made and clayed along the lower bank. The work was done departmentally, under the direction and in accordance with the plans of Mr. Leonard G. Hall, Assoc.M.Inst.C.E., the Engineer and Manager. The party proceeded on foot to the Plas Uchaf reservoir, were they were entertained at luncheon by the Chairman of the Council (Mr. J. W. Jones, J.P.) and the Chairman of the Water Committee (Mr. T. Whitley).

Incandescent Gas Lighting in Holborn.—When the scheme for lighting the borough of Holborn by gas on the incandescent system was adopted the large lamps on the public refuges were purposely omitted, with the view of gaining experience of the lighting at less important points. The Works Committee reported at the meeting of the Council on Wednesday that they were now satisfied that it was perfectly safe to convert these lamps, of which there are 49, to the incandescent system, and that if the alteration were made there would be a considerable saving of expense in lighting, owing to the diminished quantity of gas required. They were informed that a number of new lanterns would be required, but that others could be adapted. The estimated cost of the work connected with the alteration was £185. It was resolved that the refuge lamps in question should be adapted to incandescent lighting as recommended.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

As reported in our last issue (p. 978), the annual accounts of the Edinburgh and Leith Gas Commissioners were laid before them by the Treasurer (Mr. John S. Gibb) at their meeting on the 26th ult. They were prefaced by the usual statement by Mr. Gibb, as follows:—

The balance carried to the profit and loss account on the year's working is .		£91,733	0 8
There has been paid during the year—			
For Edinburgh and Leith annuities . .	£31,928 8 6		
,, Edinburgh-Portobello annuities .	1,086 3 0		
,, Amount transferred to sinking fund in respect of annuities redeemed.	2,185 8 6		
,, Do. in respect of mortgages redeemed	636 18 0		
,, Interest on mortgages, &c. . . .	32,987 6 5		
,, Expenses of mortgages	421 12 8		
Together . . .		69,245 17	1
Showing a net balance on the year's working of . . .		£22,487 3	7
From this, however, falls to be deducted the debit balance for the year to May 15, 1904 (after meeting the sinking funds contributions for that year) . . .		4,389 14	8
Leaving the sum at the credit of profit and loss account .		£18,097 8	11
This is subject to the statutory minimum charges for the sinking funds, as follows:—			
(1) For repayment of money borrowed (20s. per cent.)	£10,434 2 9		
(2) For redemption of annuities (15s. per cent.)	6,981 15 1		
(3) For reserve fund (Commissioners' Gas Order, 1902, sec. 9), ¼ per cent. on £264,183 15s. 4d. . .	660 9 0		
Together . . .		18,076 6	10
Which being deducted leaves a balance of . . . . . at the credit of profit and loss, to be carried forward to next year.		£21 2	1

There were 17,600,000 cubic feet of gas sold beyond last year; but the revenue from gas is less by £4385—resulting from the lowering of the price in October, 1903, by 3d. per 1000 cubic feet. About £1000 more has been received for residual products, from the larger quantity for sale, though the rates for tar have been considerably lower than last year. The present value of 1d. per 1000 cubic feet of gas is £7369.

The Commissioners remitted the accounts to the Finance and Law Commissioners for a report, after being audited.

The accounts show the stock capital account to be, as in previous years, £370,000, upon which there is payable, as annuities, £35,200; but of the annuities there have been redeemed £23,658, at a cost of £2218, reducing the amount payable to £32,982. Of loan capital, there has been borrowed on mortgage £837,925, and there has been received on deposit receipt £99,858, making a total of £937,783. A sum of £20,770 has been redeemed out of the sinking fund, which, in accordance with statute, is added to loan capital, and reduces the amount remaining to be borrowed from the total of £1,400,000 to £441,446, or a reduction of borrowing powers during the year of £14,305. The expenditure of capital during the year amounted to £84,539, of which £66,933 was spent at Granton, and £11,695 upon main and service pipes, and the cost of laying. The total capital expenditure is given as £1,434,183. The total outlay upon the Granton works has been £617,210.

In the revenue account the quantity of gas sold is stated to have been 1,853,876,900 cubic feet, which was 17,609,900 cubic feet more than in the preceding year. The revenue derived, less credits, amounted to £255,024, which was £4385 less. There was received for coke, £19,504, an increase of £2827; for tar, £13,614, a decrease of £4625; for sulphate of ammonia, less working expenses, £20,985, an increase of £940. The total revenue was £309,723; being a decrease of £6156. It is found that the increased output of gas has been produced from 174,688 tons of coal, which is 4588 tons less than before. The cost of coal was £108,152, or a decrease of £9067. Gas oil for carburetted water gas cost £4524, or an increase of £1641. Salaries and wages at works amounted to £23,730, a decrease of £7597. Purifying materials and wages of purifier men amounted to £2480, a decrease of £1922. Repairs and maintenance of works and plant, tools, and implements cost £20,784, an increase of £9704. The total cost of manufacturing gas was £159,670, a decrease of £12,008. Distribution cost £25,824, a decrease of £5352; management, £10,059, an increase of £386; feu-duties amounted to £560, an increase of £232; rates and taxes to £12,923, a decrease of £721. The total expenditure was £217,990; being a decrease of £18,419. The balance carried to the profit and loss account is £91,733, which is an increase of £12,263. The sinking funds were increased during the year by £16,953; and they now amount to £152,562. The reserve fund was increased by £432, and now stands at £5786.

In the gas-stove account, it is stated that the value of stoves, &c., on hand on May 15, 1904, was £12,517; the cost of stoves, &c., purchased during the year amounted to £1738; and that the expenses of repairing and fitting up stoves were £3806—making a total outlay of £18,061. There was received for the hire of stoves £3389; as the price of stoves, &c., sold, £1101; for fitting up gas-pipes, &c., £386; and there was charged to revenue account as the proportion of the cost of fittings, £30—making a total of £4906. The balance of £13,154 is given as the value of stoves, &c., on hand or lent on hire at the close of the financial year.

INCANDESCENT GAS LIGHTING FOR THE ALBERT AND CHELSEA EMBANKMENTS.

At the Meeting of the London County Council to-day, the Bridges Committee will present the following report on the above subject: "We have for some time had under consideration the question of improving the arrangements for the lighting of the Albert and Chelsea Embankments. A great improvement would be effected by the substitution of incandescent gas-lights, similar to those now in use on some of the bridges, for the present flat-flame burners. We have ascertained that it would be possible to effect this alteration by a slight modification of the existing lanterns. We understand that the Gaslight and Coke Company would be prepared to undertake the work of installing the new system of lighting suggested on the Albert Embankment for a sum of 17s. 6d. a lamp, including all necessary alterations of the existing apparatus, or for a total sum of £56 17s. 6d.; while the Company would carry out similar work on the Chelsea Embankment for a sum of 15s. a lamp, or a total sum of £50 5s. The experience which has been obtained from this method of lighting on the bridges shows that a considerable reduction in the cost of maintenance is obtained thereby, compared with the old system. In the circumstances, we suggest that the work of alteration should be proceeded with now, in order that the fresh system may be in working order by the autumn. Provision is made in the annual maintenance estimates for 1905-6, in respect of the necessary expenditure, and we recommend—'That expenditure not exceeding £107 2s. 6d. be sanctioned for the substitution of incandescent gas-lights for the present ordinary burners in the parapet lamps on the Albert and Chelsea Embankments; that arrangements be made with the Gaslight and Coke Company for the execution of the work for that amount; and that the Bridges Committee be authorized to take all necessary steps in this matter.'"

PUBLIC LIGHTING IN WESTMINSTER.

The Lighting of Parliament Square.

The Works Committee of the Westminster City Council reported last Wednesday, with reference to the Council's acceptance in February of the tender of the Gaslight and Coke Company for the lighting, maintenance, &c., of the high-pressure gas-lamps opposite the Law Courts and in Wellington Street, Strand, subject to arrangements being made for levelling the quotations for lighting, cleaning, and extinguishing the lamps (which for Wellington Street was £1 10s. per annum, and for the Law Courts £3 10s. per annum), that the Company offered to reduce their quotation for both places to £1 10s. per lamp per annum, if the lamps were left burning all night. The Committee considered this would be an advantage; the reduction in the price to be paid being practically equivalent to the extra cost that will be incurred for gas. They therefore accepted the amended offer. In a further report, the Committee stated that the Council, in July last year, accepted the tender of the Company for the lighting of Parliament Square by means of eight 700-candle power gas-lamps; but, in October, at the request of the Office of Works, who, by an old arrangement, at present undertake the lighting of the square at the cost of the Council, the preparation of the contract and the execution of the work were postponed—the Office of Works stating that they were considering a scheme for introducing incandescent lighting in the precincts of the Houses of Parliament generally. Although the Council had from time to time asked to be furnished with a decision on the subject, the Works Department had not communicated it. The Committee had already pointed out to the Council that attention had been called to the indifferent lighting of the square, and that the Council wrongly received the discredit attaching to the delay in improving it. As nearly a year had elapsed since the Council accepted the Gas Company's tender, the Committee decided, subject to the usual sanction, that the contract should be proceeded with; that the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) should be instructed to arrange for the carrying out of the work; that the attention of the Office of Works should be drawn to the facts; and that they should be informed that the Council had given instructions for the work to be proceeded with.

NOTTINGHAM CORPORATION GAS SUPPLY.

The Annual Reports.

The report of the Nottingham Corporation Gas Committee for the year to March 31 states that there was a falling off in the quantity of gas sold of 102 million cubic feet—the figures being 1885 million feet last year, as against 1987 million feet in the preceding twelve months. The gross profit of the year's working amounts to £91,941; and, after deducting the sums required for interest, annuities, sinking, and other funds, there remains £31,645 at the disposal of the Council. Of this, £27,000 will be handed over to the Finance Committee in aid of the general district rate; and the Gas Committee recommend that the balance of £4645 be carried to the trading capital and annuity redemption fund. The Committee point out that the several recent reductions in the price of gas have materially reduced the annual income.

In his report upon the works and manufacturing operations during the year, Mr. J. H. Brown, the Engineer and Manager, remarks that a large sum has been expended on repairs and maintenance during the twelve months, with the result that very considerable improvement has been effected in the working generally; and the excellent working and financial results which are now presented can be largely attributed to closer supervision and the better condition of the plant and machinery. The carbonizing plant at the Basford and the Eastcroft works is receiving special attention. More modern and improved settings have

been designed, which, after several months' trial, have given very satisfactory results, showing much lower fuel consumption and a longer life. These will be installed as the old furnaces are worn out; and it is anticipated that considerable saving will be effected by the use of such settings in the new section about to be erected at the Basford works. The reconstruction of the gas distribution plant at Basford is practically complete; and the whole of the districts are now being supplied through the new apparatus. The plant has exceeded anticipations; and, though it has been called upon to deal with the greatest amount of gas ever sent out in one day in the history of the undertaking, a regular and constant supply has been maintained throughout the whole of the area. The decrease in the amount of gas sold is mainly due to the very great depression in trade, to the large number of empty houses, and to the enormously-extended use of incandescent burners. This will be more readily appreciated from the fact that the reduction in the quantity of gas consumed by the public lamps during the year amounts to 21 million cubic feet, due to the adoption of incandescent burners. These burners are rapidly being adopted in private houses, and also in business premises. By their use, the consumer is able to increase the light obtained from 3½ candles to 20, 25, and even 30 candles per cubic foot of gas consumed. The Corporation Lighting Department have reduced the consumption of gas by the adoption of incandescent burners by 19 per cent.; and the annual receipts from this source are consequently lower by £2271. This reduction in the annual consumption of gas, says Mr. Brown, has set back for a time the gradual improvement which was being effected in the capital employed per million cubic feet of gas sold, which has returned to about the 1903 figure—namely, £588. The figures for the past four years are as under: 1902, £622; 1903, £582; 1904, £551; and 1905, £588.

Mr. Brown states that during the year 189,111 tons of coal were carbonized, yielding 2,018,743,000 cubic feet of gas, or 10,675 cubic feet per ton, as against 208,118 tons of coal carbonized during 1904, yielding 2,117,188,000 cubic feet, or 10,173 cubic feet per ton. Very considerable improvement in carbonizing has been effected at Basford, which formerly showed the worst results, but is now, owing largely to the better plant, giving results equal to those of the other works. The make per ton has increased from 9801 cubic feet in 1903, to 10,073 feet in 1904, and 10,676 feet in 1905; and further improvement is anticipated during the current year. At Eastcroft the make per ton has been more than maintained, and 10,688 cubic feet per ton has been made, against 10,243 feet for the previous year. At Radford the make per ton has also increased from 10,400 cubic feet in 1904 to 10,631 feet for 1905. For the three works taken together the total make of gas per ton has increased from 10,173 cubic feet in 1904 to 10,675 feet for 1905—equivalent to a gain of 95 million cubic feet of gas from an equal quantity of coal. But for this enormous increase in the gas obtained per ton of coal, says Mr. Brown, the financial results for the year under review would have been far from satisfactory. Carbonizing wages per ton of coal have increased from 2s. 4·14d. to 2s. 5·12d.; but though the wages per ton of coal handled have increased somewhat (due to a certain extent to more liberal treatment by the Committee), the carbonizing wages per 1000 feet of gas sold have fallen from 2·95d. in 1904 to 2·92d. in 1905—the latter figure being the lowest on record. The markets for chemical products have, in sympathy with trade generally, been exceedingly weak, resulting in what would have been considered phenomenal decreases in market values for any other product. Fifteen months ago the price at the ports of one of the principal products was 120 per cent. higher than to-day. The receipts for tar products have decreased from 2s. 0·98d. to 1s. 4·97d. per ton of coal carbonized. Ammoniacal products yielded 1s. 7·55d., as against 1s. 8·48d. per ton of coal carbonized in 1904. This decrease in the two products is equivalent to a loss of £10,640. The receipts for coke show a decrease of £4824. The gas unaccounted for increased from 6·13 per cent. in 1904 to 6·62 per cent. in 1905; but in spite of this slightly increased loss, the number of cubic feet of gas sold per ton of coal carbonized reached the highest figure recorded in the history of the undertaking.

Mr. Brown sums up by saying that the extensions which have now been commenced at the Basford works will put the undertaking in a much better position to deal with the large demands made upon it (the heaviest day's consumption last winter was greater than in any previous year by half-a-million cubic feet); and it is anticipated that a further saving will be effected in cost of manufacture at this works. Although the receipts for gas show a decrease of £20,013, due largely to the reduction of 102 million cubic feet in the quantity of gas sold, and to the reduction in price to the extent of about £7000, yet (notwithstanding the fall in residuals of practically £15,500) the exceedingly gratifying sum of £36,000 is shown as balance in the profit and loss account. The surplus profit is, with one single instance (1904), the largest that has been realized since the undertaking passed into the hands of the Corporation.

DARLINGTON GAS-WORKS RESULTS.

The accounts and statistics of the Darlington Corporation gas undertaking for the year to March 31—which bear the names of the Engineer (Mr. F. P. Tarratt) and Borough Accountant (Mr. J. W. Armitage)—show that the gross income amounted to £46,867, and the working expenses to £34,539; the figures for the previous year being £49,476 and £35,724 respectively. The net profit (after allowing for interest and liquidation of loans) is £7074, as compared with £9903. The amount handed over in aid of the general district fund is £8500; and £1403 has been placed to reserve fund. Thus the carry forward is reduced from £9903 in 1903-4 to £7074. During the past twelve months 34,065 tons of coal were carbonized to produce 338½ million cubic feet of gas, or equal to 9937 feet per ton. Of the total make, 6·52 per cent. was unaccounted for. There are 6414 ordinary and 3839 prepayment consumers. The coke and breeze saleable per ton of coal carbonized was 8·1 cwt.; the receipts from this source being equal to 11s. 2¾d. per ton. The capital amounts to £5 1s. 7d. per ton of coal carbonized; and the net charges for gas are 2s. per 1000 cubic feet inside the borough, 2s. 6d. outside, and 1s. 8d. for power purposes.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards placed two new issues of capital by order of Directors, and sold a number of stocks and shares in gas and water companies. The first lots offered consisted of some £10 fully-paid ordinary shares in the East Surrey Water Company, carrying 10 per cent. dividend; and they fetched

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p.c.	20⅞—21¼	−⅛	4 17 8
160,000	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	May 12	6½	Bombay, Ltd.. . . .	6½—7	..	4 12 10
140,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
50,000	10	Mch. 15	14	Bourne-) 10 p.c. . .	29½—30½	..	4 11 10
251,810	10	,,	7	mouth Gas) B 7 p.c. .	16½—17½	..	4 0 0
53,200	10	,,	6	and Water) Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Feb. 24	12	Brentford Consolidated	248 -253	+1	4 14 10
300,000	,,	,,	9	Do. New . . .	188—193	+3	4 13 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	127—132	..	3 15 9
206,250	,,	June 15	4	Do. 4 p.c. Deb. .	103—106'	..	3 15 6
220,000	Stk.	Mch. 15	11	Brighton & Hove Orig.	225—230	..	4 15 8
246,320	,,	,,	8	Do. A. Ord. Stk. .	165—170	..	4 14 2
460,000	20	Mch. 30	10	British	40—41	..	4 17 7
100,000	Stk.	Feb. 24	6	Bromley, Ord. 5 p.c. .	120—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—94	..	4 15 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	11⅞—12¼	..	5 14 3
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97*	..	4 2 6
150,000	20	Mch. 15	8¼	Cagliari, Ltd.	25—27	..	6 2 3
100,000	10	May 31	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p.c Pref.. .	9½—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	100—102*	+1½	4 8 3
1,400,000	Stk.	Feb. 24	5⅛	Commercial 4 p.c Stk. .	115—118	..	4 8 1
560,000	,,	,,	5	Do. 3½ p.c. do. .	111—114	..	4 7 9
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	85—87	..	3 9 0
800,000	Stk.	,,	6	Continental Union, Ltd.	108—111	..	5 8 1
200,000	,,	,,	7	Do. 7 p c Pref.	137—142	..	4 18 7
424,070	Stk.	Feb. 18	5½	Derby Con. Stk. . . .	124—126	..	4 7 4
55,000	,,	June 3	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	Jan. 27	11	European, Ltd. . . .	22—23	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
15,243,200	Stk.	Feb. 10	4⅛	Gas-) 4 p.c. Ord. . .	98½—99½	−½	4 8 5
2,600,000	,,	,,	3½	light) 3½ p.c. max. . .	92—94	..	3 14 6
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193 975	,,	June 15	3	Coke) 3 p.c. Con. Deb.	89—91	..	3 5 11
258,740	Stk.	Mch. 15	5	Hastings & St. L. 3½ p.c.	100—103	..	4 17 1
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	17½—18½	..	5 18 11
3,800,000	Stk.	May 12	10	Imperial Continental .	210—213	−1	4 13 11
473,600	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Mch. 15	6	Lea Bridge Ord. 5 p.c. .	120—125	..	4 16 0
561,000	Stk.	Feb. 24	10	Liverpool United A . .	224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B . .	166—168	..	4 3 4
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	109—111*	..	3 12 1
75,000	5	,,	5	Malta & Medn., Ltd. .	4—4½*	..	5 11 1
560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb..	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	102—104	+1	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11—12	..	5 16 8
1,565,892	Stk.	Feb. 24	4½	Newc'tle & G'tesh'd Con.	108½—109½	..	4 4 6
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	91—93*	..	3 15 3
15,000	10	Feb. 24	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	145—148	..	5 8 1
600,000	5	Mch. 30	7	Ottoman, Ltd. . .	6—6½	..	5 12 0
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	5½—6	..	5 0 0
796,980	5	Jan. 27	5	Do. 5 p.c. Pref. .	5—5½	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
851,070	10	Apl. 28	7	River Plate Ord. . . .	11¾—12¼	..	5 14 3
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97*	..	4 2 6
250,000	10	Apl. 13	7	San Paulo, Ltd. . . .	12⅝—13¼	..	5 5 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53*	+1½	4 14 4
135,000	Stk.	Mar. 15	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	235—237	..	4 4 5
123,998	Stk.	Mch. 30	5	Shrewsbury Ord. 5 p.c.	107—110	..	4 10 11
70,000	10	May 31	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Feb. 10	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,832,700	,,	Jan. 13	3	Do. 3 p.c. Deb.	90—92	..	3 5 3
575,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	121—124	..	4 8 9
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	+2	3 16 11
112,533	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	130—135	..	3 14 1
502,310	Stk.	May 12	5	Southampton Ord. . .	107—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 24	6¼	Tottenham) A 5 p.c. .	125—128	..	4 17 8
338,020	,,	,,	4¼	and) B 3½ p.c. .	98—101	..	4 14 1
125,000	,,	June 29	4	Edmonton) 4 p.c. Deb.	105—108*	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd.	9½—10	..	8 0 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102*	+½	4 18 0
30,000	Stk.	Feb. 24	7½	Wands-) A 5 p.c. . .	163—168	..	4 12 3
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	135—140	..	4 9 3
60,000	,,	,,	5⅓	and) C 3½ p.c. . .	114—116	..	4 13 6
57,564	,,	June 29	3	Putney) 3 p.c. Deb. Stk.	80—85*	−½	3 10 7
745,872	,,	Mch. 15	5	West Ham 5 p.c. Ord. .	102—104	..	4 16 2
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	123—126	..	3 19 4
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109*	+1	3 13 5

Prices marked * are "Ex div."

£23 10s. each. Biddings were then invited for a new issue of £5 shares in the Woking District Gas Company, Limited, carrying 7 per cent. dividend as from the 1st prox.; and they were all placed at from £6 to £6 10s. per share. A parcel of fully-paid £10 shares in the Whitchurch and District Gas Company, Limited, carrying a dividend at the rate of 4 per cent. per annum, was disposed of at £8 per share. A new issue of £4000 additional consolidated ordinary 5 per cent. stock of the Maidenhead Gas Company (last dividend at the rate of £5 7s. 6d. per cent. per annum) was next offered, and all sold at £100 to £102 per £100 of stock. Some £1 fully-paid shares in the Hungerford Gas Company, Limited, carrying 4 per cent. dividend, were sold for 16s. and 17s. each. A few £10 fully-paid shares in the Ascot District Gas Company (last dividend at the rate of 5 per cent. per annum, free of income-tax) fetched £10 5s. per share. The final lots were £10 fully-paid shares in the Soham and District Gas Company, Limited; and they were sold for £2 per share. On the previous day, some original £10 shares in the Rugby Gas Company were sold at £31 7s. 6d. and £31 10s. each, *cum. div.* (13 per cent.). At a local auction sale recently, 105 original £10 shares, with dividends due, in the Rugby Gas Company were disposed of at prices ranging from £31 7s. 6d. to £31 10s. each.

METROPOLITAN WATER BOARD.

The Recent Shortage of Water in the Lambeth Area.

The principal subject which was brought before the members of the Board at a special meeting held on Friday, under the presidency of Sir R. M. Beachcroft, was the recent short supply of water in portions of the Lambeth area. On this matter the Works and Stores Committee reported that on June 20 and 21 a shortage of water occurred in the neighbourhood of Beckenham, Penge, Clapham, Balham, and Tooting, forming a portion of the Lambeth area. They had inquired fully into the circumstances of the case, and had had before them a report of the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.). It appeared from this report that, owing to the turbidity of the Thames, in consequence of the heavy storms of Saturday and Sunday, the 17th and 18th of June, the filters of the Lambeth area were rapidly choked; and on the morning of the 19th it became evident that, if the bad condition of the river continued, the filters would not be able to meet the requirements of the district. In these circumstances, arrangements were made for an additional supply of water to be obtained from the reserve works of the Southwark and Vauxhall system and the intercommunication works. The Chief Engineer informed the Committee that these precautions had been taken before any complaints were received from the districts; and, moreover, every effort was made to clean the filters—a large number of contractors' men being employed, in addition to every available man in the service of the Board—the work being carried on continuously during daylight. In spite of these efforts, a shortage of water occurred on Tuesday and Wednesday; but on the Thursday morning (the 22nd) the supply had resumed its normal condition. The Committee were satisfied that with the works available every possible step was taken by the Engineers to cope with the difficulties of the situation; but they thought it would be obvious that the mere fact that a shortage of this kind occurred was conclusive evidence that the existing works, which the Board took over from the Lambeth Company in 1904, were insufficient to meet the requirements placed upon them. As a matter of fact, the Engineer of the Lambeth district called the attention of the Directors of the Lambeth Company, before the "appointed day," to the need for additional works; and this need was also urged by the Board's witnesses before the Court of Arbitration. It was in these circumstances that the Board some months ago—on the Committee's recommendation, and with the advice of the Chief Engineer—authorized the expenditure of upwards of £30,000 for the improvement of the supply in the Lambeth district; and these works, which were being pushed forward with all possible speed, would be practically completed in about three weeks. The report was received.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Lord Ardwall's decision in the action against the Edinburgh and Leith Gas Commissioners with reference to the pollution of a brewery well (given upon another page) came somewhat unexpectedly last Thursday, as he had indicated that he would take some time to prepare the judgment; and the importance and nature of the case seemed to require that it should be carefully considered. Now that we have his Lordship's finding, and his opinion at length upon the different points of a mysterious case, some observations may be made upon it. In the opinion itself there are glaring assumptions. Such, for instance, is his Lordship's somewhat laboured account of how, to his mind, the tarry matter found its way into the well. He holds it not to be proved, but assumes it to be a probable suggestion; and, upon this assumption, he proceeds further to assume that the polluting material came from the gas-works. There seemed little evidence in support of his theory. As a matter of fact, the evidence was to the effect that no polluting material escaped from the works. The pursuers essayed to prove that the polluting material was allowed to escape in the course of a particular operation. This, according even to his Lordship's view, has been disproved; but he proceeds to satisfy himself that, there being no other source proved from which the material could have come, it must, and did, come from the gas-works. Another assumption is the one, in law, that the pursuers had raised a case which had been established by the evidence. If the case had not been in a Scotch Court, this conclusion might have been accepted. But in Scotland both the law and the practice is that a person suing must place on record what it is that he proposes to prove. If he fails to prove the specific averment

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made, he loses his case. Pursuers averred that the pollution arose from negligence in the emptying of a tar-tank. His Lordship finds that the pollution was caused by tar, but which did not come from the operation specified. In doing so, he lays himself open to the argument, when the case goes further, that he has travelled beyond the record. The defenders may be expected to maintain that they, according to his Lordship's admission, met the case on record, and that, having done so, they were entitled to prevail. From what I have written, it would cause no surprise if the decision were attacked furiously, on more grounds than one. There is one ground which I cannot help setting out, and the suggestion of which comes from his Lordship's elaborate theory about the unknown drains in the gas-works. Lord Ardwall conjures up a riddle of old drains underneath the works. When he was assuming, without evidence, that these might be connected with the fault, should he not have gone further, and assumed that there were drains of great antiquity outside the gas-works as well? He relied upon the evidence given by Mr. J. Massie, the Burgh Engineer, that the public sewer was absolutely water-tight; but Mr. Massie referred to the sewer "from where it comes under the North British Railway line down to where it passes the pursuers' well." Further to the west than the point where Mr. Massie began his examination, the sewer passes through West Princes Street Garden; and it is the same sewer down which the refuse that he spoke of as coming from the Caledonian Railway Company's oil-gas works flowed. The sewer in that portion was found to be in a deplorable condition, and was reconstructed, where it passes through the garden, last year. What if accumulations of tarry matter were in that deplorable sewer, and the operations of workmen had allowed it into old drains, down which it flowed, until it got into the strata leading into the well? This is, of course, assumption; but the point of the remark is that when his Lordship assumed so much, he might have gone further, and assumed that there were other possibilities underground which had not been brought before him in evidence.

Regarding the amount of damages which has been awarded, it cannot be said that it is unreasonable; but in the fixing of it Lord Ardwall clearly travelled beyond the case, because, in taking ten years as the period of the duration of the pollution, he proceeded upon his own personal knowledge as to the time that water may be contaminated by tar. The pursuers asked a period of twenty years to be fixed. Lord Ardwall has given them ten years, and has thereby alleviated the burden which he has thrown upon the shoulders of the Gas Commissioners. The best, and the worst, which can be said of the decision is that it is a good deal mixed, which gives ground for the expectation that the Commissioners will, when they come to consider it, resolve, without hesitation, to carry the case to a Higher Court.

I have sent you a summary of the accounts of the Edinburgh and Leith Gas Commissioners for the past year; and after having written so much, both last week and this, about the Commissioners' business, I feel that I should simply note the fact that the accounts have turned out exceedingly well. Though there is only £21 carried forward, this is done after wiping out a deficit of £4389 from the previous year. The surplus on the past year's working was, therefore, £4410. There may be an opportunity for looking into the accounts when they again come before the Commissioners, which will be after they are audited.

This week the Tenth Annual Convention of the Incorporated Municipal Electrical Association met in Edinburgh and Glasgow. It was to be expected that there would be comparisons made, in the course of the proceedings, between electric and gas lighting; and accordingly I find the President (Mr. F. S. Newington, of Edinburgh), in his opening address, saying that "gas experts had succeeded in very much improving the incandescent gas-mantle—so much so, that it was now very suitable for the lighting of streets where a large amount of light was not necessary, and where, therefore, arc lamps would be too powerful. Just at present there did not seem to be any form of electric lamp that could quite compete with the incandescent gas-mantle for this purpose. There were some new forms of electric lamps, more or less in the experimental stage at present, that appeared to be very promising, as they were exceedingly economical. They might therefore soon expect to have a lamp that could be used for side-street lighting at a less cost than the incandescent gas-mantle." Then, in a paper by Mr. E. E. Hoadley, of Maidstone, upon "Street Lighting," it was stated that "the Nernst lamp was simply the principle of the gas-mantle applied to electric lighting;" and, further on, the author stated that he considered the Nernst lamp, "though far from perfect, had been the saviour of side-street lighting business for the electric world." One day was spent in Glasgow; and on that occasion Sir John Ure Primrose, the Lord Provost, at a luncheon given to the visitors, "ventured to caution officials and members of municipal bodies, who had such vast undertakings under their care, to keep in mind that these undertakings had been founded and built up at great capital cost. They had been built up without any absolutely certain tenure of life; and he would therefore counsel that sinking funds and reserve accounts should be built up, and that no municipality should be tempted to take from the earnings of the electric department for the relief of the rates of the city." In the same strain, Mr. A. D. Mackenzie, who was the guiding hand, in its early stages, of the electric lighting scheme of Edinburgh, at the annual dinner, urged them to "endeavour to keep up the reserve fund, and to strenuously fight the battle for keeping such undertakings on their own feet." From these references it would appear that the electric world is, at the present time, far from being strong upon its legs, or its feet, both in the mechanical and the financial sides of it.

The Auchterarder Gas Company held their annual meeting on Monday last. The balance-sheet showed the Company to be in a prosperous state. A dividend at the rate of 5 per cent. was declared. The gas was retained at the same price for ordinary consumers; but for cooking and heating it was reduced to 4s. 2d. per 1000 cubic feet. The report of the Directors of the Kinross and Milnathord Gas Company for the past year states that the working proved satisfactory; there being a net surplus of £422, after allowing for bad and doubtful

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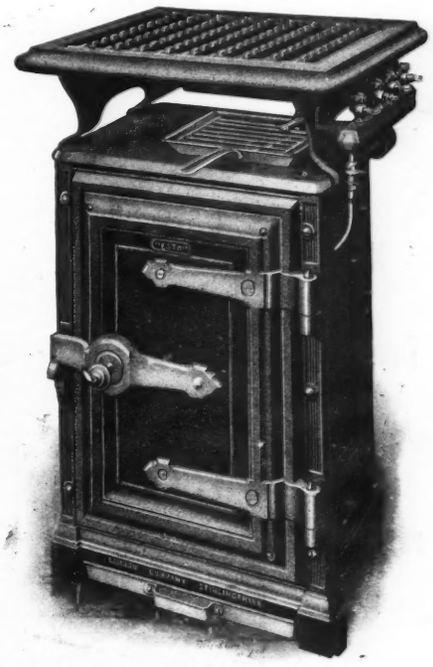

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Agencies at London, Liverpool, Manchester, Bristol, Newcastle-on-Tyne, Glasgow, Birmingham, Dublin. Southampton.

debts. This, together with £180 brought forward from the previous year, makes £602 available for division. The Directors propose a dividend at the rate of 7½ per cent., and the setting aside of £250 as a reserve fund, and that £127 be applied as depreciation of buildings and plant, reducing their book value to £3094.

The session of the Scottish Junior Gas Association having come to an end with the meeting of the Eastern District this afternoon, it is appropriate to remark that the expectations of those who were responsible for the formation of the Association have been amply justified by the result. In both districts much excellent work has been done. There has been no lack of matter upon which to exercise the minds of the members—in fact, quite the opposite. At the meeting this afternoon two excellent papers were read; and, when published in full in the "Transactions" of the Association, they will prove valuable means of guidance for junior members, both on account of the information they contain and as examples of what may be done.

The Western District of the Scottish Junior Gas Association held a most successful excursion a fortnight ago. About seventy members and their friends attended. The excursion took the form of a sail down that incomparable waterway, the estuary of the Clyde.

The proceedings at Peebles this afternoon brought to an end a period of strenuous labour on the part of the Corporation of the Royal Burgh, and of their most capable Gas Manager (Mr. A. Bell, jun.), and they open another chapter which, we trust, will be as harmonious and profitable as that which has just closed. The resources of gas management were seldom better illustrated than they have been in Mr. Bell's successful accomplishment of the task of getting a production of nearly 30 million feet of gas a year out of works which were considered to be about taxed to their utmost when the output was only one-half of what it now is. The new works have been designed by Mr. Bell with great skill, and reflect as much credit upon him as upon the Town Council, who gave him a free hand to provide what he thought necessary. They are new works financially as well as in reality. The old works are to be dismantled, but the site retained; so that there will be a dead loss upon them. The new works will have to bear the burden of the old ones as well as their own. All this has been taken into account by the Corporation, who have not only gone into this scheme with their eyes open, but have themselves created the situation which has made the new scheme a necessity. They might have gone on for years to come with the old works; but their Treasurer (Mr. W. H. Williamson) is a man of energy, and he resolved that the business of the Gas Commissioners should be pushed. He early adopted the policy of supplying ordinary sizes of gas-cookers free; and the result has been an enormous increase in the consumption of gas, and the placing of the undertaking upon a sounder basis than it was when he became associated with it.

The annual report by the Directors of the Galashiels Gas Company states that the profit for the year amounted to £2642; and this sum, with £6132 in the reserve fund, makes a total of £8774 available for division. A dividend at the rate of 10 per cent., free of income-tax, is recommended, which will leave £6674 to be carried forward. The Kelso Gas Company have paid the usual dividend of 10 per cent., and resolved to reduce the rent of gas-cookers from 10 to 5 per cent. on the actual cost, and to give facilities for hirers becoming the owners of stoves. The Coldstream Gas Company have paid a dividend of 6 per cent. The Anstruther Gas Company had a profit last year of £685. It is proposed to pay a dividend at the rate of 5 per cent., to apply £287 to depreciation of works and plant, to place £100 to capital account, and to carry forward £98.

The Arbroath Corporation Gas Committee have resolved to recommend the abolition of rents for gas-cookers up to a value of £5 5s., but that trade appliances be not supplied free. They have also resolved to recommend a reduction in the price of gas by 2½d. per 1000 cubic feet, making it 2s. 11d. to ordinary consumers, and to reduce it from 3s. 9d. to 3s. 4d. to consumers with prepayment meters. The price was reduced last year by 5d. per 1000 cubic feet.

CURRENT SALES OF GAS PRODUCTS.

Week ending July 1.

The London market for tar products remains firm, and with little alteration in prices. Makers of pitch, in consequence of large forward sales that have been alluded to, are in a comfortable position, and are indisposed to assist "bear" operations. The value for September-December may be put at 29s. 6d. to 30s. net, f.o.b. makers' wharves. For 90 per cent. benzol, 9¼d. to 9½d. net is obtainable; while for 60's crude carbolic acid, 1s. 9½d. net has been declined. Crystal carbolic acid is steady. There are a good many inquiries for creosote oil; but the available supply is very limited. Sulphate of ammonia is still rather neglected; but the price is nominally the same as a week ago.

LIVERPOOL, *July* 1.

Sulphate of Ammonia.

The market has been quiet throughout the week, and prices are again easier; the closing quotations being £12 8s. 9d. per ton f.o.b. Hull, and £12 12s. 6d. per ton f.o b. Liverpool and Leith. There has been a moderate demand, but the anxiety of makers to clear out their bins has occasioned the acceptance of lower prices. There has been inquiry for July, and spot prices have been paid for near delivery. The forward position has been quite neglected, although manufacturers would make some concession upon recent quotations.

Nitrate of Soda.

This article has declined further; and the closing spot prices are 10s. 7½d. and 10s. 10½d. per cwt., for ordinary and refined qualities, respectively.

No Drawing Stage required.

Hot Coke Fed to Producer.

WRITE FOR ESTIMATES.

PATENT "DWARF" INCLINED BENCH.

NEW CONVEYOR CO., LTD., SMETHWICK.

Tar Products.

LONDON, *July* 1.

There has certainly been rather more business doing during the past week, and, as a rule, the market has a generally healthier tone. A considerable quantity of 50-90 per cent. benzol has been sold at 8½d. per gallon for July-August; while in 90 per cent. there is very little offering. London makers have again declined 9d. for prompt delivery; but something under this figure has been accepted in the Provinces for home consumption. There is considerable inquiry for forward delivery; but at the present manufacturers do not seem at all anxious to sell, unless at an advance on present prices. In solvent naphtha there has been more demand for export; one or two contracts having been arranged for consumption in France during the past week. The position remains unchanged in toluol, and there is really nothing offering at the moment. In creosote, further business is reported at 1¼d. in Yorkshire; while 1⅜d. has been paid for especially good makes. In Lancashire, prices still rule very low, and 1½d. has been accepted in more than one instance; in fact, a very salty quality was sold at a little under this. In London, the principal producers are very firm in their ideas, and do not show any signs of reducing their quotations at present, although there are small quantities of salty oil offering at under the prices quoted by the larger makers. In carbolic acid, there are still buyers at 1s. 9d. for July-August delivery, and business is reported at this price to the end of October. Consumers appear quite willing to contract forward at this figure, but manufacturers will only sell for prompt, and are asking 1s. 10d. to 1s. 10½d. for August-December. Business has again been done in crystals at 6¼d. to 6⅜d. for 39-40 per cent.; and it is reported that offers of 6½d. have been declined for a considerable quantity. Pitch still continues quiet, and it is almost impossible to fix the actual value for prompt. Business has been done in South Wales during the past week at very low prices for delivery over the last six months of the year; and although there are more inquiries for August-December, the briquette makers do not seem at all inclined to pay the prices asked by makers or dealers. So far as Yorkshire is concerned, distillers report sales at very good prices for shipment over the whole of next season; but these, as a rule, are for special makes, as some makers have accepted considerably under the figures mentioned for delivery over the next three to four months. In London, there is very little doing. Makers generally ask 29s. to 29s. 6d.; but consumers do not appear to be inclined to pay these prices, although at from 28s. to 28s. 6d. there is no doubt a fairly large business could be done. In Lancashire, there are several parcels offering for early delivery at very reasonable prices; but manufacturers do not care to sell forward, owing to the fact that most of their tar has been taken on the sliding-scale. There are inquiries from Belgium for forward delivery; but consumers' ideas of price are very low, and certainly do not tempt dealers to speculate.

The average values during the week were: Tar, 16s. 6d. to 21s. 6d. Pitch, London, 28s. 6d. to 29s.; east coast, 28s. to 28s. 6d.; west coast, 26s. 6d. to 27s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 8½d. Toluol, 8½d. Crude naphtha, 3½d.; solvent naphtha, 8½d. to 8⅝d.; heavy naphtha, 10d. to 11d. Creosote, London, 1½d. to 1⅝d.; North, 1¼d. to 1⅜d. Heavy oils, 2d. to 2 1/16d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Refined naphthalene, £4 to £8; salts, 12s. 6d. to 14s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been decidedly quiet during the past week, and prices generally have ruled rather easier, although there has been very little business doing. At Beckton, the nominal price is £12 15s., but the Gas Company are not at all anxious to sell. The South Metropolitan Gas Company are quoting £12 15s. on their own special terms; but at this price business is not possible at present. In Hull, makers ask £12 10s.; but it is quite impossible to arrange business at this price, and it is reported that sales have been made for forward delivery at under this figure. There does not appear to be much business doing at Leith. The price is nominally £12 to £12 2s. 6d.; but even at this, there are no sales of importance to report for either prompt or forward delivery. There is not very much doing at Liverpool just at the moment, and prices are, if anything, a little easier all round.

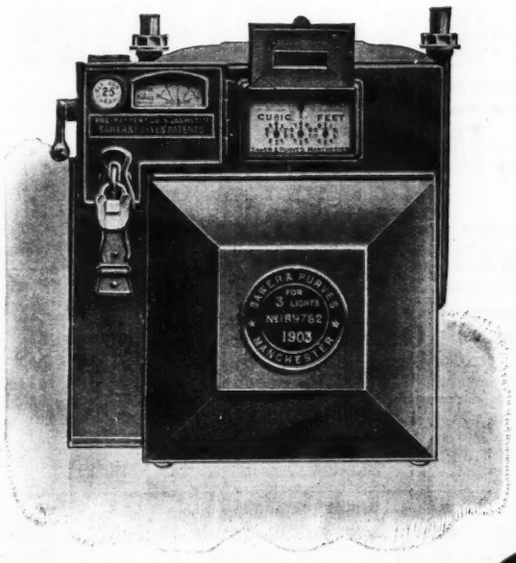
COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal trade of the county Palatine shows little variation from last week's conditions. House coal is at its lowest ebb; the tropical weather of late having rendered household fires unnecessary. The demand for engine fuel keeps up very well indeed. There is a more or less scarcity of slack, especially for the best sorts. The orders for gas coal are fewer—the majority of the contracts for this class of coal having been already placed on the basis of last year's terms. The demand for coke shows an improvement. The shipping trade is quiet. The non-payment for "extras" or "odd" work at many of the Lancashire collieries is said to be the cause of considerable dissatisfaction among miners, and price lists are being arranged for submission to the employers on behalf of over 10,000 miners, which if not approved in the proposed or some modified form, trouble is expected; but anything approaching a strike in the present condition of the coal trade would only re-act on the men. They would, as always happens, be the greatest sufferers.

Northern Coal Trade.

After the great local holiday, the work at the collieries is fuller; and there is a steadier output by the miners generally. At present, the output is well taken up; but the demand is not a pressing one. The exports are barely up to the average at this season, when the Baltic needs are usually heavy. In steam coals, the market is steady; best Northumbrian steams being about 9s. 6d. per ton f.o.b., second



The "Positive"

SAWER & PURVES
MANCHESTER &
NOTTINGHAM.

class steams 8s. 3d. to 8s. 6d., and steam smalls from 4s. 9d. to 5s. 6d. Gas coal is now rather more freely delivered, but it is in quantities that are much below the average, except in the case of collieries that ship a large part of their produce. The price varies from 7s. 9d. to 8s. 6d. per ton f.o.b. for Durham gas coals, with one or two kinds at a little higher value. The contracts have been allotted for one of the towns on the south coast; but the price is substantially unaltered, if the usual allowance be made for the sea freight. Other contracts are in negotiation. Coke is very firm; and gas coke benefits by that and by the limitation of the output, so that the stocks are slight. Last week's prices continue.

Scotch Coal Trade.

Though trade is still quiet, there is a little more activity; but it must be confessed that the improvement is almost wholly confined to the shipping branch of business. The market being in a sort of transition state, there is no change in prices, which are quoted as: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 8s. to 8s. 9d., and splint 8s. 3d. to 8s. 6d. The shipments for the week amounted to 262,505 tons—an increase of 4952 tons upon the previous week, but a decrease of 12,952 tons on the corresponding week of last year. For the year to date, the total shipments have been 5,673,604 tons—an increase of 390,271 tons.

Cookery Lectures at Newry.—The Technical School at Newry was recently well filled for four consecutive evenings with most appreciative and highly interested audiences at the practical lectures on cookery delivered by Miss Margaret Lovell (gold medallist, Earl's Court, 1904), under the auspices of the Gas Department of the Newry Urban District Council. The proceedings were opened by Mr. T. P. Ledlie, the Chairman of the Gas Committee. In the practical development of her programme, Miss Lovell used Wright's "Eureka" cookers, of which there are more than a hundred in use in Newry. There was also a special display of lighting and heating appliances—the lighting being under the supervision of Mr. Brooke Gibson, the Manager of the Newry Gas-Works. The exhibition was a marked success.

Improvements at the Devonport Gas-Works.—Since his appointment as Engineer and Manager of the Devonport Corporation Gas-Works, Mr. J. W. Buckley has given considerable attention to the question of the condition of the plant and the necessity of enlarging its manufacturing capacity to meet the growing requirements of the district. Provision is already being made for increased storage, and there is every prospect that the new holder which is in course of erection will be available when the winter demand arises. With regard to the manufacturing plant, it was resolved by the Town Council a few months ago to accept the tender of Messrs. S. Cutler and Sons for the installation of carburetted water-gas plant; and in view of Mr. Buckley's report on the subject, it has been decided by the Gas Committee that the erection of the plant shall be proceeded with as soon as possible.

Serious Gas Explosion at Morriston.—Owing to an escape of gas, a violent explosion occurred in a house at Morriston last Sunday week. On a man named Rees returning with his wife and daughter from chapel, he struck a match in order to obtain a light, and an immediate explosion was the result. The windows were blown out, and the roof of the house practically destroyed; while the different members of the family were seriously burnt about the face and hands.

New Water-Tower at Boston.—A new water-tower, which has been erected by the Boston Water Company on the Horncastle Road, was brought into use for the first time last Tuesday. It measures 41 ft. 6 in. by 37 ft. 6 in., and is 4 ft. 9 in. deep. It has been erected, from the designs of the Manager (Mr. John Shaw), for the purpose of storing surplus water at night in order to give a more regular pressure during the day; and its effective capacity is 40,000 gallons. The opening ceremony was performed by Mr. W. Pooles, the Chairman of the Company (who is a member of the Town Council), in the presence of a numerous assemblage of officials and others.

Opening of New Electricity Works at Dublin.—The Pigeon House electrical station of the Dublin Corporation, which has been working for some time, and about which so much has been heard, has at last been formally opened; the ceremony being made the occasion of a good deal of self-congratulation. The scheme has all along been the subject of severe criticism; and now that the plant has been taken over from the Contractors (the General Electrical Supply Company, Limited), the Corporation will have ample opportunity of demonstrating the soundness of their policy. We may hope with Mr. Mark Ruddle, the City Electrical Engineer, that the Press, instead of having to call attention to the various shortcomings of the undertaking, will now be able to chronicle steady progress. Mr. R. Hammond announced that the station had already been running for two years, and was now full up, and a complete success. For the moment everything is being painted in the brightest possible colours; but then, as the local papers remind us, a loan of £100,000 is at present being sought.

Inspecting the New Loughborough Water-Works.—At the invitation of Alderman Mayo, the Mayor of Loughborough, a large party (including members of the Corporation, officials, and friends) last week inspected the new water-works at Blackbrook. After high tea had been served, Mr. Wilfred Moss proposed "Success to the Loughborough Water-Works Undertaking," remarking that he had been particularly struck with the headway made since last year; and though this had been accompanied by a greater outlay than had been anticipated originally, a very valuable asset would accrue to the borough. He paid a high compliment to the Engineers (Messrs. Hodson), to the Committee, the Chairman (Mr. J. Cartwright), and the Clerk of the Works (Mr. Robinson). By virtue of the agreement entered into, he said, Loughborough proposed to supply Leicester with some of its surplus Blackbrook water; and the bargain was, he thought, a good one for both parties. Mr. Cartwright, who responded, enlarged on the good services rendered during the year by the Committee as a whole, and referred to the satisfaction felt at the progress made.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft

AND IN ADDITION, 7,900,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON B.C.

CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG

APPLICATIONS FOR LETTERS PATENT.

12,611.—Rose, A., and Bellamy, W., "Inverted mantle-holders." June 19.
12,666.—Lake, H. H., "Mantles." A communication from the Deutsche Gasglülicht Aktien-Gesellschaft Auergesellschaft). June 19.
12,677.—Sandmann, F. W., "Gas-generators." June 19.
12,700.—Mitton, A. E., "Inverted burners." June 20.
12,722.—Lefevre, H. J. G., "Incandescent burners." June 20.
12,752.—Miller, S., "Water-valves." June 20.
12,769.—Semmler, C., "Gas-motors." June 20.
12,789.—Woodall, H. W., and Duckham, A. M'D., "Settings for vertical or inclined retorts." June 20.
12,811.—Stewart, J. T., "Joint for pipes." June 21.
12,827.—Moeller, J., "Inverted burners." June 21.
12,828.—Moeller, J., "Incandescent mantles." June 21.
12,866.—Atkinson, L. B., "Measuring the flow of fluids." June 21.
12,889.—Hamilton, J. H., "Internal combustion engines." June 22.
12,897.—Watson, M., "Gas-heated radiators." June 22.
12,954.—Smith, W. B., "Incandescent burners." June 22.
12,967.—Anderson, R B., "Telescopic holders." June 23.
12,977.—Bennett, C. H., "Gas-furnaces." June 23.
12,987.—Parsonage, W. R. "Gas-stoves." June 23.
13,016.—Crapper, N., "Gas-boilers." June 23.
13,019.—Rappaport, R., "Gas-turbines." June 23.
13,037.—West, J., "Discharging retorts." June 23.
13,054.—Dempster and Sons, R., Ltd., and Mitton, W., "Discharging retorts." June 24.
13,078.—Rotheram, K., and Johnson, W., "Change-giving mechanism for prepayment meters." June 24.

The East Surrey Water Company, as will be seen by an announcement which appears in our advertisement columns, are inviting tenders for 1000 ordinary shares of £10 each.

Messrs. John Harper and Co., Limited, of the Albion Works, Willenhall, are sending out an artistic pamphlet showing their gas cookers, grillers, hot-plates, and ranges; also their wrought-steel gas-meter bracket.

The Directors of the Richmond Gas Stove and Meter Company, Limited, have declared an interim dividend for the six months ending June 30, at the rate of 6 per cent. per annum on the £5 cumulative preference shares, and at the rate of 10 per cent. (free of income-tax) on the £1 ordinary shares.

The "Daily Chronicle" states that a large quantity of human bones were disinterred on Saturday in Castle Street, High Wycombe, in connection with the laying of a gas-main. The street was made nearly half-a-century ago through the parish graveyard, so as to give access to the railway station.

Mr. Corbet Woodall has presented a lengthy report to the Belfast Gas Committee; concluding with the remark that, in his opinion, it will be necessary to find a new site for the gas-works. Mr. Stelfox, the Engineer, has been asked to state his views upon it; and then both documents will be submitted to the Committee for discussion.

At the meeting of the Uxbridge Urban District Council last Tuesday, it was decided to erect a high-service water-tank and tower to hold 100,000 gallons, in accordance with plans to be prepared by the Engineer (Mr. Courtney), make the necessary alterations to the mains to provide for a separate high service and fire system for the upper part of the district, and apply to the Local Government Board for their sanction for the outlay.

A novel pumping plant is under construction for the Casino (N.S.W.) Water-Works. The supply will be drawn from the Richmond river by a four-stage centrifugal pump in a shaft 10 feet in diameter and 55 feet deep. This pump will be driven by a horizontal tandem compound engine at the ground level, and it is rated at 9700 gallons per hour against a total head of 178 feet. The water will be forced into a 480,000 gallon concrete service reservoir.

We have received from Messrs. Arnold Goodwin and Son, of Sumner Street, S.E., a pamphlet and several circulars relating to their specialities. The former shows a few examples of how the firm's overhead lift-ways have been applied to various works and factories, so as to facilitate the handling of heavy material from place to place; and the latter give particulars of their system of raising water by compressed air, their hydraulic operating valve, lifting blocks, and piston rings.

The Wholesale Fittings Company, Limited, has been registered with a capital of £30,000, in £1 shares, to acquire the businesses carried on by J. Altman, as the Wholesale Fittings Company, by D. Mandler, as the Crown Incandescent Light Company, and by H. Ogus, as the Perfect Mantle Company; to adopt an agreement with these parties; and to carry on the business of manufacturers of, agents for, and dealers in, incandescent mantles and burners, and all kinds of incandescent gas-lighting materials and fittings, gaseliers, chandeliers, stoves, &c. There will be no initial public issue.

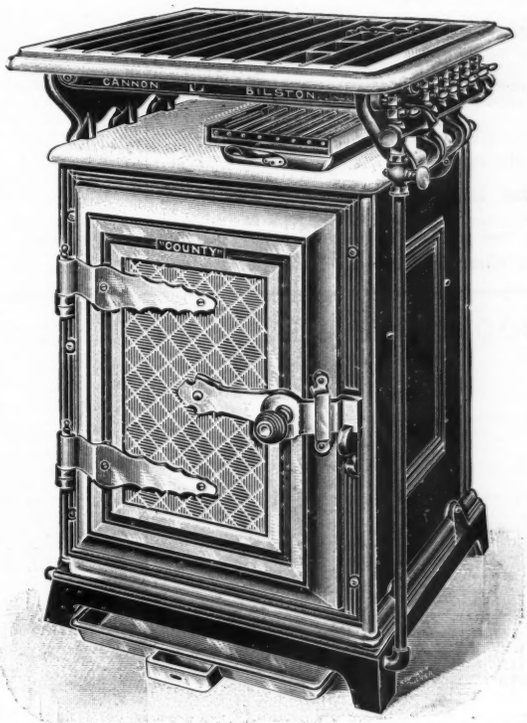
The report and accounts just presented to the Corporation by the Nottingham Water Committee show that the revenue of the department during last year amounted to £2588 more, and the expenditure to £294 more, than for the previous twelve months. After paying the annuities, interest on loans and consolidated stock, and the annual contributions to the different sinking funds, the ultimate balance of profit is £5223. This amount has been carried forward to the account for depreciation, renewals, Derwent water, compensation to workmen under the Workmen's Compensation Act, 1897, and other purposes—making that fund £25,597; and as an item of the account the future liability of the Corporation to pay calls to the Derwent Valley Water Board has been added. This liability will fall upon the Corporation when the Board first supply water to the city.

"CANNON"

NEW PATTERN

GAS COOKERS

FOR HIRING OUT.



THE "COUNTY."

Supplied in 4 Series of 4 Sizes each.

UP-TO-DATE, with all the LATEST IMPROVEMENTS.

LARGE OVEN SPACE, SPECIAL VALUE.

NOTE—

Don't forget our PORCELIRON ENAMELLING.

CANNON IRON FOUNDRIES, Ld.,

Deepfields, near Bilston, Staffs.

London Office and Show-Rooms:

Bath House, 57-60, Holborn Viaduct, E.C.

As will be seen from our advertisement columns, an exhibition of gas appliances for lighting, heating, and power is to be held during September, under the auspices of the Newcastle-upon-Tyne and Gateshead Gas Company. The largest hall available has been selected for the purpose; and advantages are offered to exhibitors in the shape of a merely nominal charge for space and a cheap supply of gas. The Newport (Mon.) Gas Company are planning a similar exhibition for October; and we are informed that arrangements are being made with leading manufacturers for an effective display of cookers, fires, stoves, engines, fittings, and general apparatus. It is intended to have specimen rooms fitted with up-to-date examples of the application of gas to modern household requirements; and a variety of popular and interesting features will also be introduced. The self-intensified system of gas lighting is being largely adopted in the leading business establishments of Newport in preference to electricity; and it is confidently anticipated that the proposed exhibition will do much to further the popularity of gas as an illuminant, as well as for the other purposes for which it is suited.

WANTED, FOR SALE, CONTRACT, &c. ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

TRAVELLERS. No. 4427.
MANAGER (FITTINGS DEPARTMENT). Sculcoates Gas Works.
ASSISTANT-MANAGER (NEWHAVEN). Sutton Gas Company.
CLERK (GAS AND WATER COMPANY). No. 4429.

Partner with Capital Wanted. No. 4416.

Situations Wanted.

SECRETARY AND MANAGER. No. 4426.
IN GAS-WORKS (PREMIUM OFFERED). No. 4425.
DRAUGHTSMAN OR ASSISTANT. No. 4428.

Exhibition. Application for space to Newcastle-on-Tyne Gas Company.

Automatic Gas-Meter Arrangement Wanted. No. 4424.

Plant, &c., for Sale.

PUMPING MACHINERY. Birmingham Water Department.

Gas Works for Disposal. No. 4418.

Plant (Second-Hand) Wanted.

GAS ENGINE AND EXHAUSTER. No. 4419.

Company Meeting.

EUROPEAN GAS COMPANY. London Office. July 18. 2 30 o'clock.

Stocks and Shares.

CROYDON GAS COMPANY. July 11.
EAST SURREY WATER COMPANY. July 28.

TENDERS FOR

Benzol.

HEYWOOD GAS DEPARTMENT. Tenders by July 18.

Coal and Cannel.

LINCOLN GAS DEPARTMENT. Tenders by July 15.
MALTON GAS COMPANY. Tenders by July 10.
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SHIPLEY GAS DEPARTMENT. Tenders by July 15.
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WINSFORD GAS DEPARTMENT. Tenders by July 11.

Gasholder and Tank (Removal and Re-Erection).

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Lime.

HEYWOOD GAS DEPARTMENT. Tenders by July 18.

Pipes and Fittings.

HEYWOOD GAS DEPARTMENT. Tenders by July 18.

Purifiers.

BURSLEM GAS DEPARTMENT. Tenders by July 12.

Roof, &c., and Tank.

COVENTRY GAS DEPARTMENT. Tenders by July 17.

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Tar and Liquor.

ALTRINCHAM GAS COMPANY. Tenders by July 12.
CAXTON TYPE FOUNDRY, MARKET HARBOROUGH.
HEYWOOD GAS DEPARTMENT. Tenders by July 18.
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Applications for space for Exhibits of interest are invited.
The charges for space will be nominal and Gas will be supplied at 2s. per 1000 cubic feet less 50 per cent. discount for prompt payment.
Prospectus and Forms of Application for space will be sent upon request to the JOINT MANAGERS, Newcastle-upon-Tyne Gas Exhibition, 43, Grainger Street, NEWCASTLE-UPON-TYNE.

WANTED, a situation as Draughtsman or ASSISTANT to Gas Company or Contractors. Thorough Practical Experience in all kinds of Gas Apparatus and Constructional Steelwork.
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Apply, stating Wages required and full Particulars, to G. MEAD-ROBINS, Gas Office, Sutton, SURREY.

CLERK wanted in a Gas and Water Company. Salary £70 per Annum. Age preferably about 25 Years. Previous Experience in same line necessary.
Apply, by letter, with *copies* of not more than Three Testimonials, to No. 4429, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager for the Gas Fitting Department of the British Gaslight Company's Hull Station. Applicants must have had good Show-Room Experience.
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WANTED, a simple, Reliable arrange- ment of AUTOMATIC GAS-METER.
Particulars, in German, to be sent to No. 4424, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Further Particulars and Order to view to be obtained from the SECRETARY, Corporation Water Offices, BIRMINGHAM.

BURSLEM CORPORATION.
(GAS DEPARTMENT.)

THE Committee are prepared to receive TENDERS for Two PURIFIERS.
Particulars from the undersigned, to whom Tenders must be sent on or before Wednesday, July 12.
HENRY PEATY,
Secretary and Manager.
Burslem Corporation Gas-Works,
Longport, Staffs., June 30, 1905.

THE Shipley Urban District Council invite TENDERS for the supply of screened GAS COAL and GAS NUTS required at the Shipley Gas-Works for the Twelve Months ending June 30, 1906.
Tenders to be sent to the undersigned on or before Saturday the 15th of July.
Any further Information may be obtained from the Manager, Gas-Works, Shipley.
I. LINDOW,
Clerk of the Council.
Council Offices, Manor House,
Shipley, June 23, 1905.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)
TENDERS FOR COAL.

THE Gas Committee of the Lincoln Corporation invite TENDERS for the supply of 26,000 Tons of screened or unscreened GAS COALS, to be delivered during a period commencing the 1st of August, 1905, and terminating the 31st of July, 1906.
Further Particulars and Forms of Tender may be obtained from the undersigned.
Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered on or before the 15th of July next.
The Committee do not bind themselves to accept the lowest or any Tender.
JNO. CARTER,
Manager.
Gas Offices, Lincoln,
June 28, 1905.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of LIME, TUBES and FITTINGS, SULPHURIC ACID, and BENZOL; and also for the purchase of surplus TAR.
Specification and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.
Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.
Sealed and endorsed Tenders to be sent to me not later than Tuesday, July 18, 1905.
By order,
GEO. G. BOUCHIER,
Town Clerk.
Municipal Buildings, Heywood,
June 14, 1905.

TENDERS FOR GAS COAL.

THE Directors of the Malton Gas Company invite TENDERS for the supply of about 5000 Tons of GAS NUTS or COBBLES in the Year ending June 30, 1906.

Tenders, stating price per Ton delivered at Malton Station, to be sent to the undersigned on or before the 10th of July inst., from whom further Particulars and Forms of Tender may be obtained.

The Directors do not bind themselves to accept the lowest or any Tender.

HENRY TOBEY,
Secretary.

Malton Gas-Works,
July 1, 1905.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply of the whole or part of 4000 Tons of best screened GAS COAL, to be delivered during the Year ending July 31, 1906, at the London and North Western or Midland Railway Station, Market Harborough.

Conditions and Form of Tender may be obtained from the undersigned, to whom sealed Tenders, endorsed "Coal," must be delivered not later than Saturday, the 15th of July next.

The lowest or any Tender not necessarily accepted.

ALFRED T. HARRIS,
Manager and Secretary.

Gas Offices, St. Mary's Road,
Market Harborough, June 28, 1905.

URBAN DISTRICT COUNCIL OF WINSFORD.

THE above Council are prepared to receive TENDERS for the supply of CANNEL and best screened GAS COAL, to be delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the L. & N. W. Railway, or at the Council's Wharf on the River Weaver at Winsford. The material is required for a term of Twelve Months ending the 1st of August, 1906.

The probable quantities required will be about 300 Tons of Cannel and about 1500 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of reasonably increasing or decreasing quantities named.

The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of the contract.

Sealed Tenders, stating price per Ton, delivered as above, are to be received by the undersigned on or before the 11th of July, 1905, and endorsed "Gas Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender and further Particulars may be had on application to the Gas Manager, F. Sidwell, Winsford, or from

JNO. H. COOKE,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, June 26, 1905.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for,

1.—CARBURETTED WATER-GAS PLANT, capable of supplying 250,000 feet per day of 24 hours.

2.—REMOVAL and RE-ERECTION of a Two-Lift GASHOLDER and TANK.

Particulars and Specification may be obtained from Mr. Edward Jones, Gas Engineer, Gas-Works, Treforest.

Tenders, endorsed "Water-Gas," must be received by the undersigned not later than July 11, 1905.

The Committee do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

District Council Offices,
Pontypridd, June 27, 1905.

TO IRONFOUNDERS AND ROOF CONTRACTORS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the supply and erection of the following WORK:—

SPECIFICATION No. 21.

STEEL ROOFS with supporting Cast-Iron Columns and covered with Corrugated Sheeting, for an Oxide and Lime Shed, 172 ft. by 62 ft. 6 in. and Coke Shed, 50 ft. by 30 ft. Also STEEL ROOFS for the following buildings: Generator House, 46 ft. 9 in. by 46 ft. 9 in., Boiler House, 34 ft. 6 in. by 45 ft. 3 in., and Exhauster House, 32 ft. by 45 ft. 3 in. Also a Steel Joist Floor, 33 ft. 9 in. by 12 ft. 6 in.

Approximate total weight of material 182 Tons.

SPECIFICATION No. 22.

Cast-Iron Elevated WATER TANK 17 ft. by 32 ft. with Girders to support same, Cast-Iron Staircase, and Chimney Cap.

Total weight of material, about 43 Tons.

Copies of Form of Tender, with Specifications, Bills of Quantities, and blue Prints of Drawings, may be obtained on application to the undersigned, and on payment of 30s. in respect of Specification No. 21, and 15s. in respect of Specification No. 22. These payments will not be returned.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders must be delivered not later than the first post on July 17, 1905, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and endorsed respectively "Tender for Roofs" and "Tender for Cast-Iron Water Tank, &c."

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
July 1, 1905.

TENDERS FOR TAR.

THE Committee of the Warwick Gas-light Company hereby invite TENDERS for the purchase of their surplus TAR for One or Three Years.

Tenders to be delivered on or before Tuesday, July 11, 1905.

Any further Information can be obtained from

WALTER T. TEW,
Manager.

Warwick, June 29, 1905.

THE Stretford Gas Company are pre-pared to receive TENDERS for the surplus GAS TAR and AMMONIACAL LIQUOR produced at their Works (together or separately) for a period of One, Two, or Three Years, commencing July 1, 1905.

The Directors are prepared to make the Contract on the sliding-scale basis or otherwise.

Tenders to be sent in, addressed to the Chairman, endorsed "Tenders for Tar," &c., on or before Monday, July 10, 1905 (Twelve o'clock noon).

Form of Tender may be obtained from the Secretary.

The Directors do not bind themselves to accept the highest or any Tender.

BENJAMIN HAYNES,
Secretary.

Stretford, June 16, 1905.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply, delivery, and connecting up to existing Plant of a new SATURATOR about 6 ft. by 4 ft. 3 in., to be made solid rolled plate or cast lead.

Further Particulars on application.

Tenders to be endorsed "Saturator," addressed to the Chairman of the Gas Committee, and sent to me on or before Tuesday, July 18, 1905.

WM. NORTH,
Engineer and Manager.

Stourbridge Gas-Works,
July 1, 1905.

SLOUGH GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the supply of 4000 Tons of best screened GAS COAL, to be delivered at Nash's Siding on the Great Western Railway at Slough in the usual monthly quantities as may be required during the period of One Year from the 1st of August, 1905.

Tenders should state description of Coal and Colliery from where Coal is obtained.

Payment for Coal on or before the 20th of the following month after delivery.

Tenders to be delivered to the undersigned, endorsed "Tender for Gas Coal," on or before Tuesday, the 11th prox.

ARTHUR THOMAS,
Secretary.

High Street, Slough,
June 29, 1905.

ALTRINCHAM GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company invite TENDERS for the surplus TAR produced at their Works between the 1st of July next and the 30th of June, 1906.

Estimated quantity, 1000 Tons.

Delivery into Contractor's or Gas Company's Tank-Waggons at Altrincham Station, or in Contractor's Barrel Carts at the Gas-Works; and separate prices should be given in each case.

Sealed Tenders, addressed to the Chairman and endorsed "Tender for Tar," to be delivered not later than noon on Wednesday, the 12th of July.

The Directors do not bind themselves to accept the highest of any Tender.

J. E. LAMB,
Manager.

Gas Offices, Altrincham,
June 29, 1905.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 18th day of July next, at 2.30 p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are H. E. Jones, Esq., M.Inst.C.E., and Edward Felix White, Esq., and the retiring Auditors are J. Reeson, Esq., and A. T. Eastman, Esq., who, being eligible for re-election, offer themselves accordingly.

The Accounts to be submitted to the Shareholders will be opened for inspection at the Company's Offices on and after the 13th of July next.

Notice is Also Given, that the TRANSFER BOOKS WILL BE CLOSED from the 17th to the 31st of July next, both days inclusive.

By order of the Board,
W. WILLIAMS,
Secretary and General Manager.

Finsbury House, Blomfield Street,
London, E.C., June 30, 1905.

To Trustees and Others.

MESSRS. HOOKER & WEBB have re-ceived instructions to SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, July 11, at Two o'clock precisely, in 164 Lots,

£15,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK
of the
CROYDON GAS COMPANY.

Particulars and Conditions of Sale may be had of the SECRETARY at the Offices of the Company, Katharine Street, CROYDON; at the MART, E.C.; and of the AUCTIONEERS, 4, High Street, CROYDON. Telephone No. 122 Croydon.

EAST SURREY WATER COMPANY.

SALE OF ORDINARY SHARES BY TENDER.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER

1000 ORDINARY SHARES OF £10 EACH
OF AND IN THE
EAST SURREY WATER COMPANY.

The Last Day for the reception of Tenders will be Friday, the 28th day of July next, at Twelve o'clock at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon application at the Company's Office, Redhill, Surrey.

By order,
A. E. CORNEWALL-WALKER,
Secretary.

Redhill, Surrey, June 23, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

In the Matter of the Rotary Meter Syndicate, Limited.

IN LIQUIDATION IN CONSEQUENCE OF SALE TO THE ROTARY METER COMPANY (1905), LIMITED.

NOTICE is Hereby Given, that the Creditors of the above-named Company are required, on or before the 31st day of July, 1905, to send their names and addresses and the particulars of their Debts or Claims, and the names and addresses of their Solicitors (if any), to Squire Edward Worsley, of 1, Mawson Chambers, Deansgate, Manchester, Secretary to the Liquidator of the said Syndicate, and if so required, by notice in writing from the said Liquidator, are, by their Solicitors, to come in and prove their said Debts or Claims at such time and place as shall be specified in such notice, or in default thereof they will be excluded from the benefit of any distribution made before such debts are proved.

Dated this 21st day of June, 1905.

ALFRED GRUNDY, SON, AND CO.,
Solicitors to the above-named Liquidator.

78, King Street, Manchester.

Now Ready, pp. 584 and XVI. 251 Illustrations. F'Cap. Quarto, Price 18s. net (Post Free).

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New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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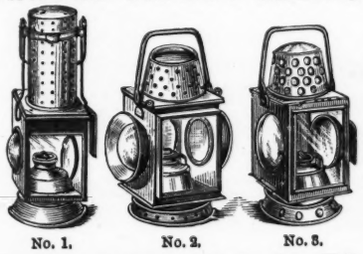

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.

Above the Average in Weight and Quality of Coke.

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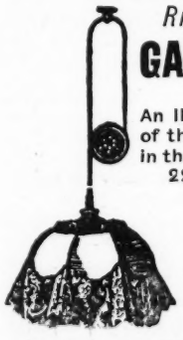

An Illustrated Description of this Pendant appeared in the "Journal" for Nov. 22, 1904 (page 599).

Write for full Particulars to the
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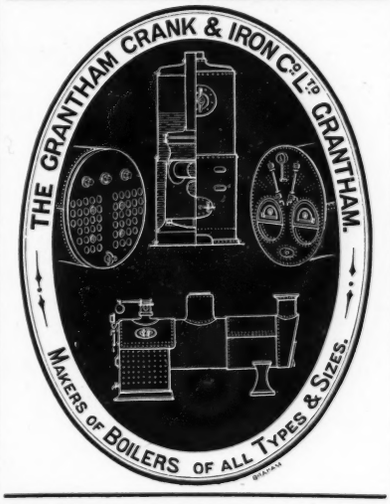

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Manufacture and keep in Stock at their Works (also large Stock in London)
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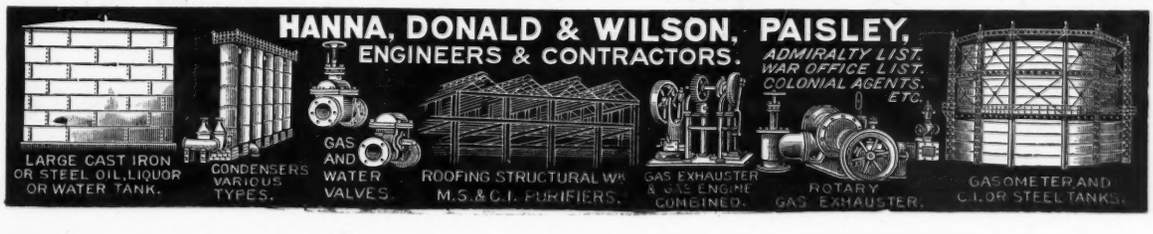
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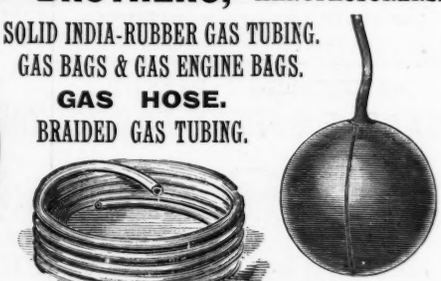

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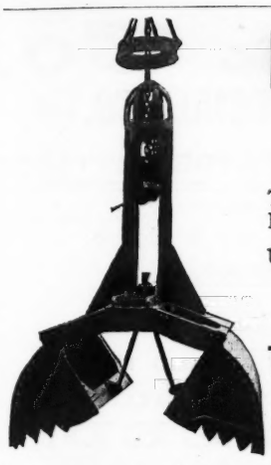

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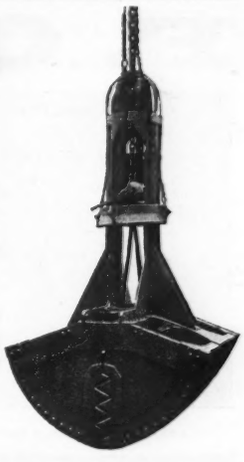

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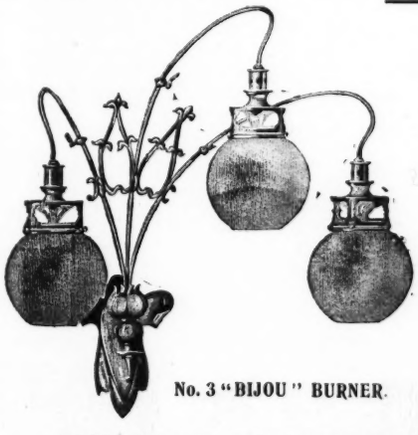

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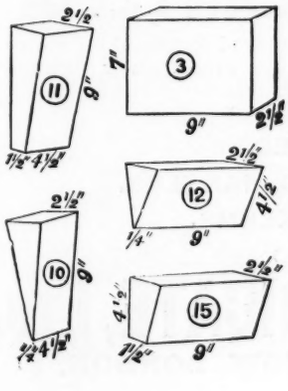

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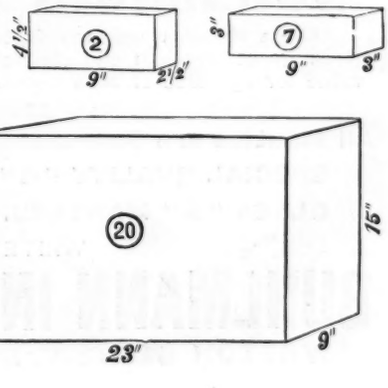

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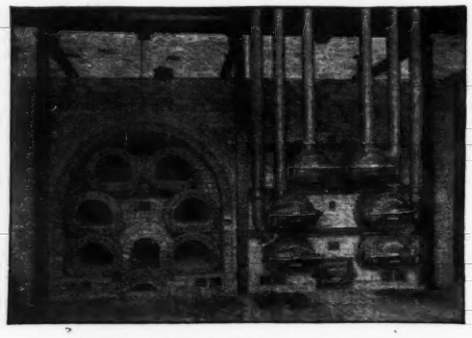

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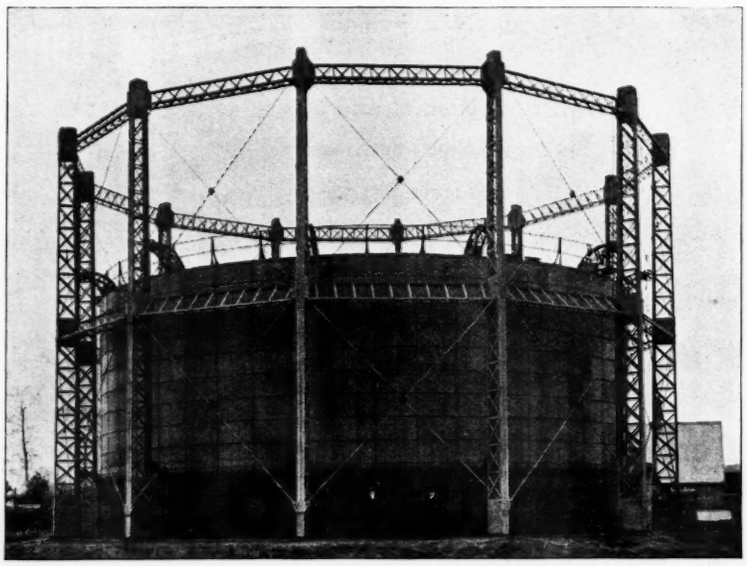

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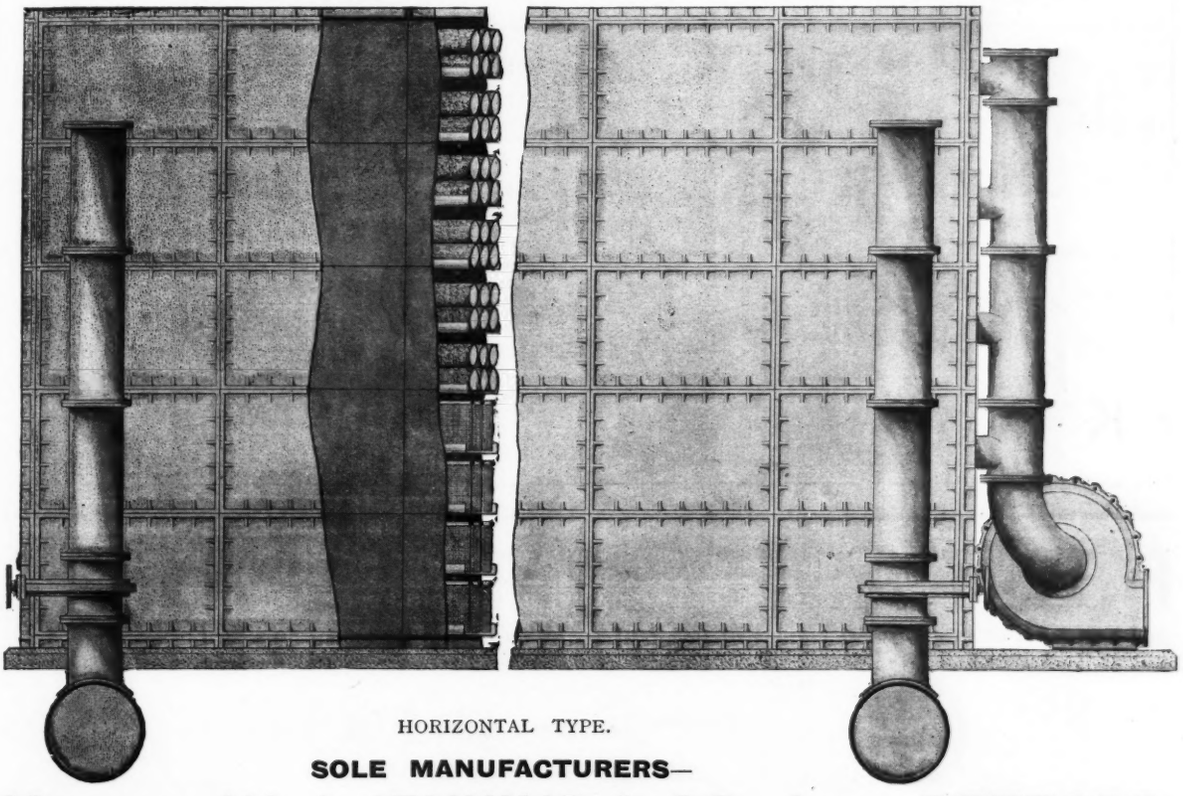
In these Air Condensers a greatly increased efficiency is secured by Internal Evaporation of a comparatively trifling quantity of water, with or without Fan draught.



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Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

Patent MACHINE-MADE RETORTS

These Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made. *Retorts carefully Packed for Export.*

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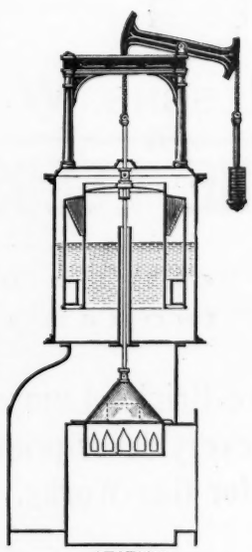
PATENT SAFETY STATION GOVERNORS.

The result of many years' varied experience in their design and manufacture, they effectually Control Pressure under the most exacting conditions.

From a photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



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The Bell is enclosed and in communication with the outlet of the Governor, thus responding to the slightest variation in outlet Pressure. Small weights are conveniently placed for operating the Governor, or "The Peebles' System of Air-Loading" from a distance may be employed. All Governors are carefully tested before being dispatched, and the material and workmanship is of the best possible description.

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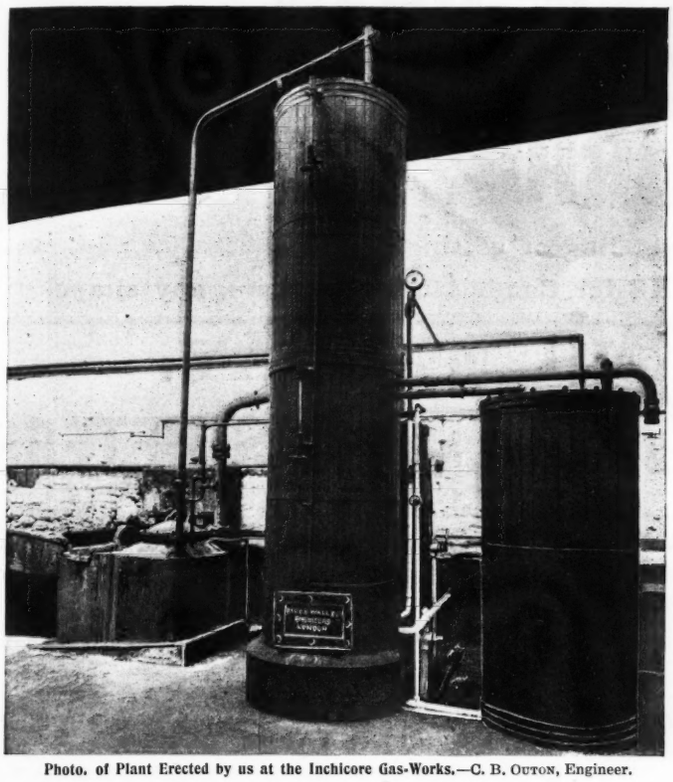

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Sulphate of Ammonia Plants with our **Improved Still,** trays removable and easily cleaned, highest economy in working, splendid quality of salt (actual results in practice, 25·50 per cent. of ammonia), self-discharging Saturators and every modern improvement. **Lead Burners** sent anywhere on receipt of telegram, for urgent repairs.

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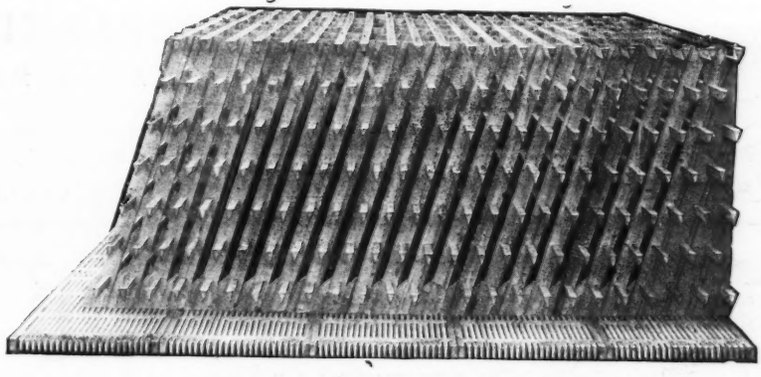

Can make the Change from the Old to the New System without any Stoppage.

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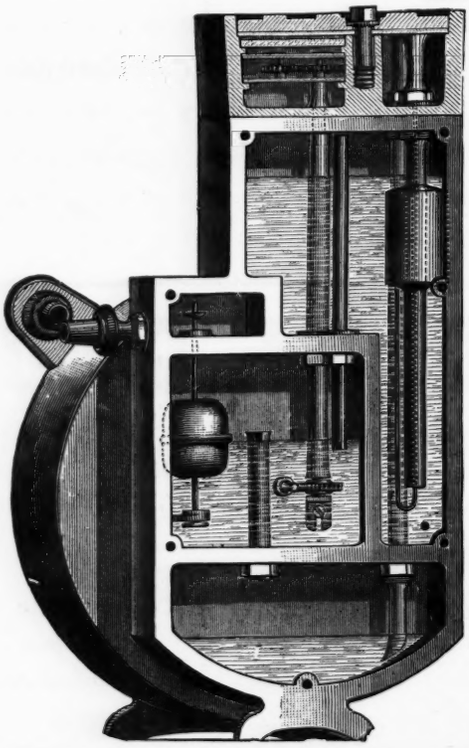

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Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost, No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

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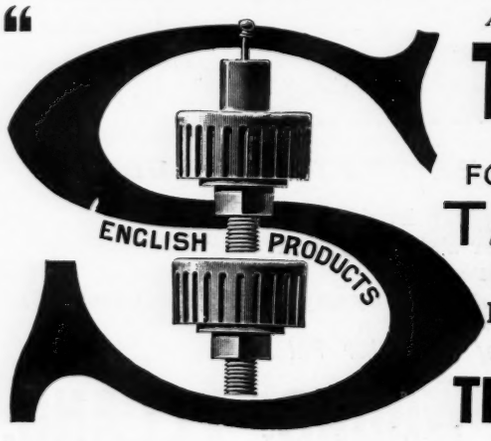

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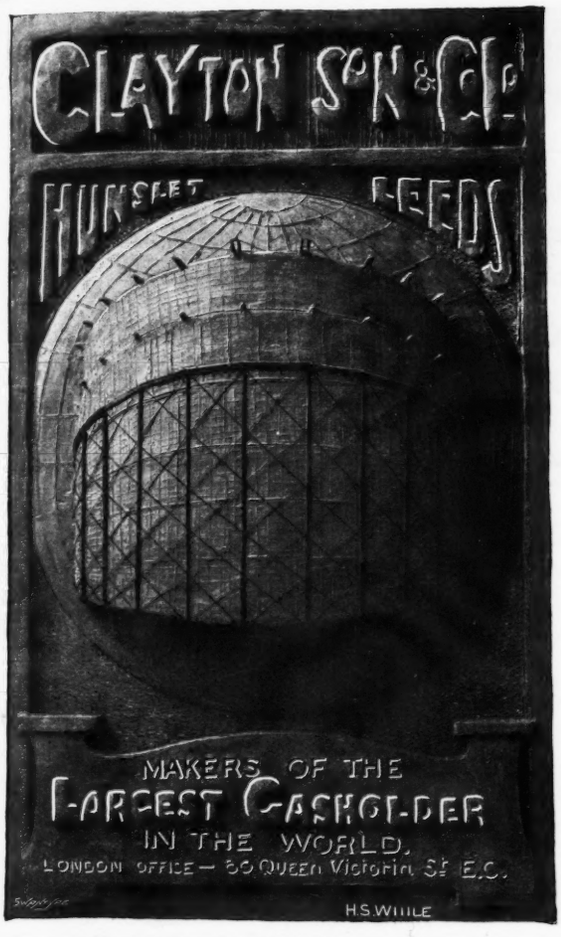

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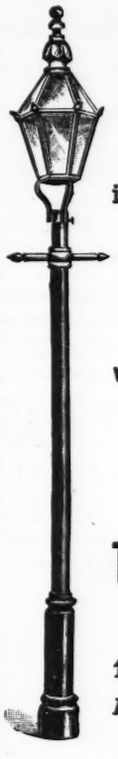

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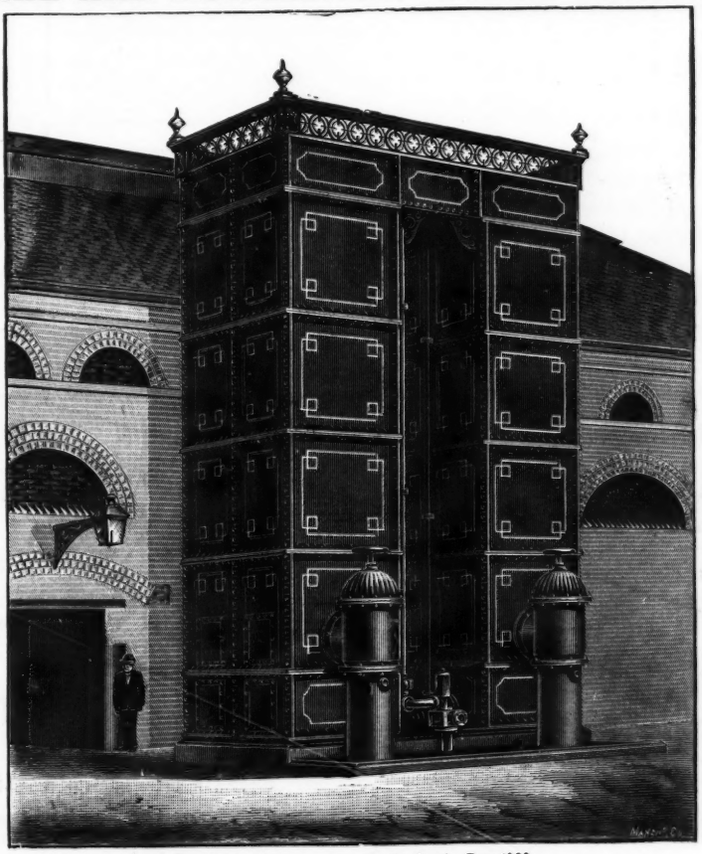

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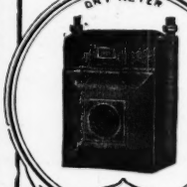

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